



SOLVAY TECHNICAL AND ENGINEERING SERVICE  
First Edition - 1st Printing 1959  
Bulletin No. 15

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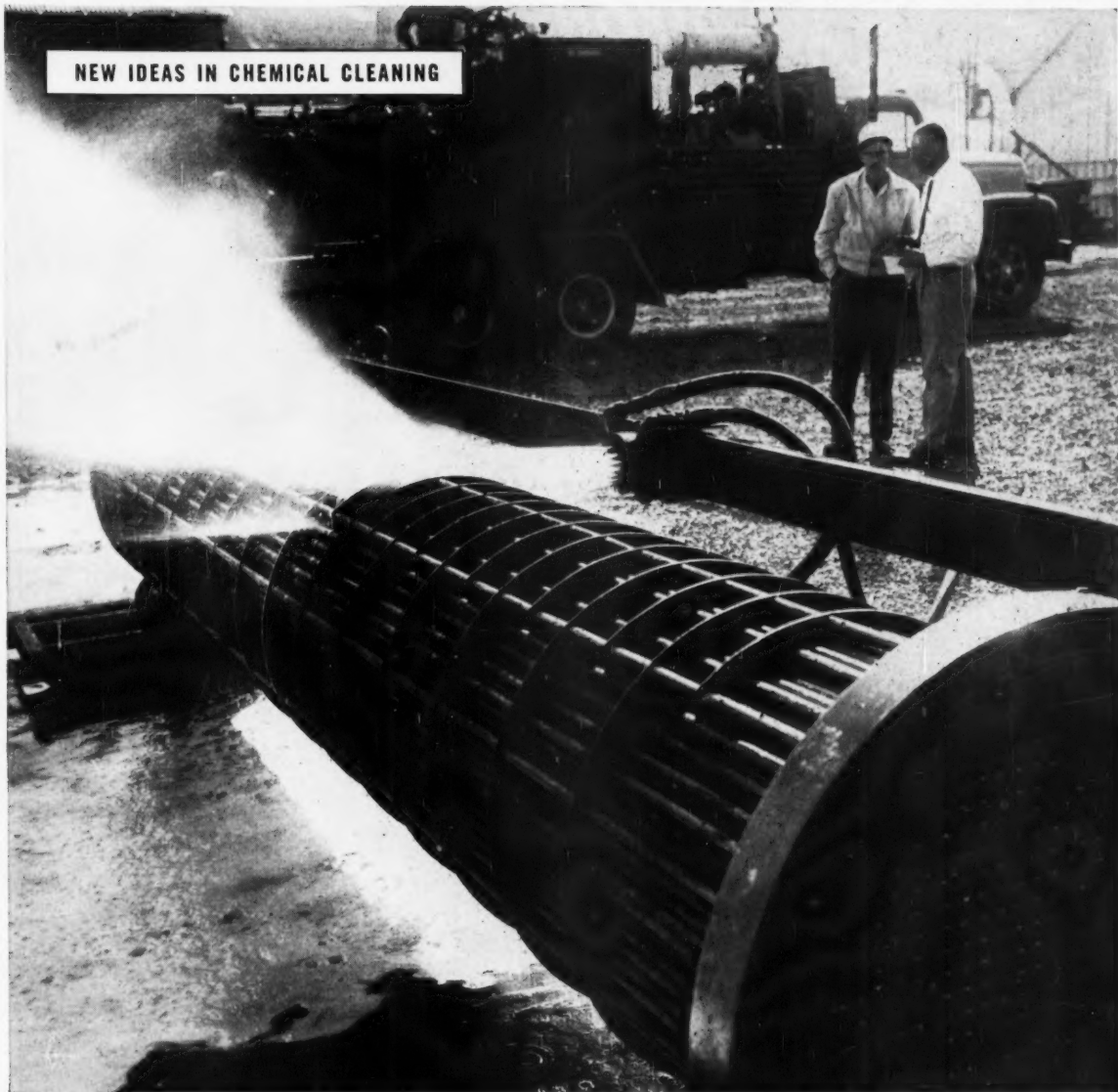
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DP-59

NEW IDEAS IN CHEMICAL CLEANING



## New Jetting Tool To Clean Tube Bundles Saves Thousands Of Dollars

The new high-pressure hydraulic tool, shown above, is currently saving thousands of dollars for companies in the refining, chemical, and petrochemical industries. It is the jetting tool developed by Dowell to remove deposits from heat exchanger tube bundles.

Previous methods of cleaning these bundles have been costly, time-consuming and often inadequate. Many times bundles had to be replaced completely because of the lack of a suitable cleaning method.

This new Dowell tool has a remarkable record of thorough, fast cleaning. For example, a slurry reboiler exchanger bundle, three feet in diameter and 16 feet long, was fouled with deposits of coke and asphalt. After being jetted from only one side, the bundle was

thoroughly clean. Time required: less than one hour.

The tool holds the bundle in place for cleaning and has flanged rollers for rotation. The jet-head is manipulated automatically so that all tube spaces are covered. The jetted liquid can be either water or chemical solvents.

This high-velocity jetting device is another example of the new ideas Dowell continues to offer in chemical cleaning to help you cut your costs. Whatever the cleaning problem in your plant, call Dowell for an engineered recommendation. Dowell—the largest, the oldest, the most experienced chemical cleaning service—Tulsa 1, Oklahoma; and 165 stations and offices in major industrial centers.

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TOP OF THE WEEK

AUGUST 8, 1959

- ▶ **Reinforced isopolyester resins cut equipment maintenance costs** by saving both labor and materials .....p. 31
- ▶ **Here's how the Smithsonian Institution uses specialties** to keep its displays in top shape. ....p. 47
- ▶ **Atlantic Refining's new \$10-million wax recovery plant** boasts improved solvent dewaxing process .....p. 63
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23 Another spate of CPI mergers link companies in fertilizers, plastics, cement, uranium and lithium ores.

23 In one week, three chemical plant explosions. Casualties: one employee dead, four injured, several buildings destroyed.

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## ***In acrylic lacquer systems . . .***

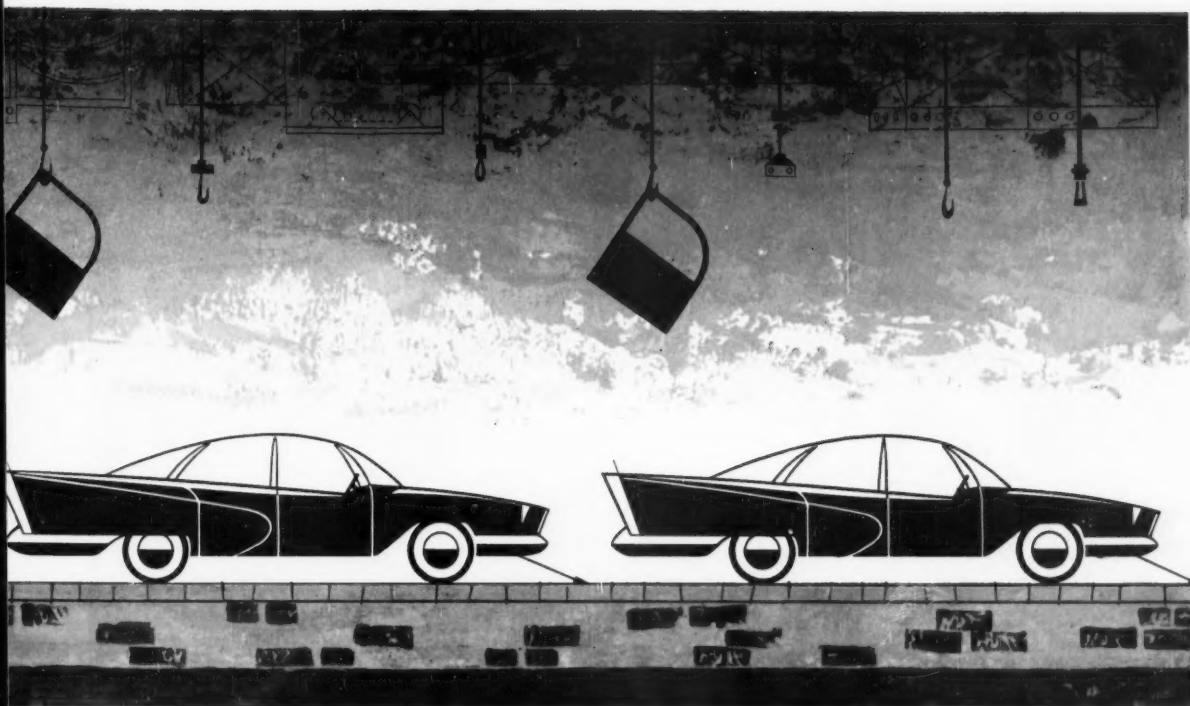
# Ketone solvents give outstanding performance

Ketone solvents have long been preferred in the formulation of nitrocellulose, vinyl, epoxy, and other types of modern finishes. And now . . . with the arrival of acrylic finishes . . . ketones have again proved star performers. You can add acrylic lacquers to your line of coatings without adding solvents to your inventory.

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Ketones are economical, too. Because of their exceptionally high solvent power, a little goes a long way! When you standardize on ketones, you save on inventory and storage space, too . . . because you need fewer solvents to do the same job!



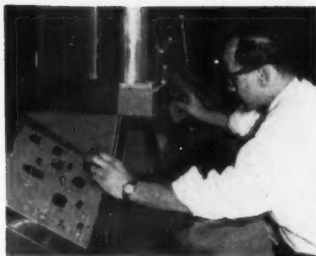
*...plus economy*

Through extensive research on acrylic lacquers, Shell Chemical has achieved a clearer understanding of the effects of specific solvents on film properties. This knowledge, backed by years of experience in surface coating technology, can help you achieve maximum performance and economy with ketones in acrylic formulations.

For further information, or help with specific lacquer formulation problems, contact your nearest Shell Chemical district office.

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Lacquer film integrity is being studied with an electron microscope at the Shell Chemical Technical Service Laboratory at Union, New Jersey.



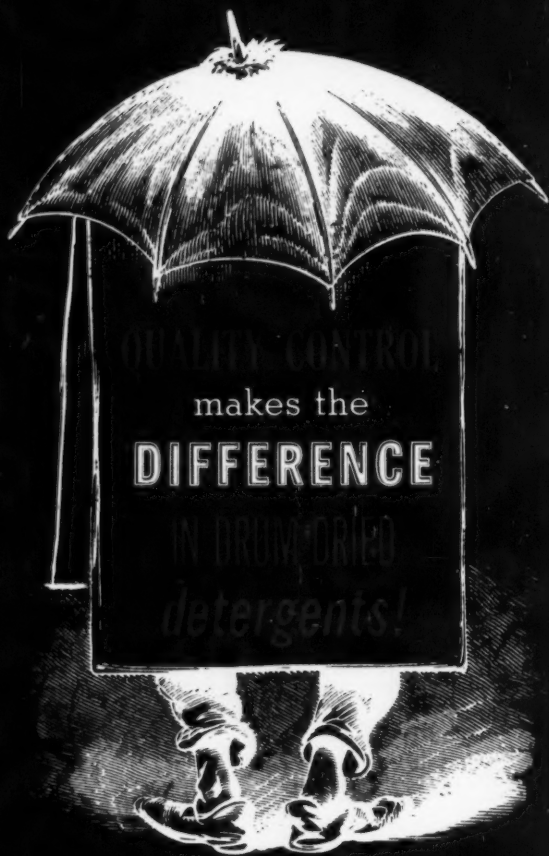
To better understand solvent release, hardness of lacquer film is being determined with Tukon Micro Hardness Tester at Shell's Technical Service Laboratory.



Gas-liquid chromatography apparatus for solvent analysis.



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AUGUST 8, 1959

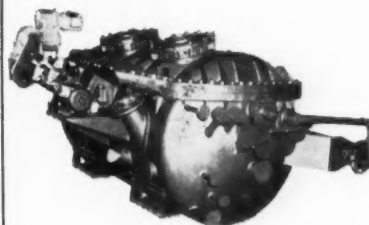
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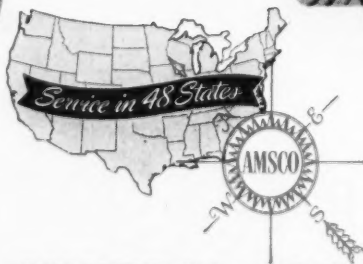
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## OPINION

### Defining a Distributor

TO THE EDITOR: Your article on the problems of chemical distributors (*CW*, July 4, p. 63) certainly covers the field. But it would seem to me that many of these difficulties are caused by a misunderstanding of the basic functions of a chemical distributor.

There are some who believe a distributor should stock and sell products of competing manufacturers, with no basic allegiance to anyone. He buys at the most favorable offering and consequently sells at a price to move this product. A customer is never sure of the manufacturer of the material delivered to him. The manufacturer is never sure his material is being shipped to accounts he has referred to the distributor. The manufacturer completely loses his identity.

How much better it would be to encourage the chemical distributor:

(1) Who acts as a constructive sales arm of the manufacturer.

(2) Who understands the needs and problems of the manufacturers who supply him.

(3) Whose line is made up of products that are basically noncompetitive — who represents only one manufacturer on a product or group of products.

(4) Who operates in a local area, knowing local people and their businesses intimately.

(5) Who maintains high morale in his sales and office staff.

(6) Who develops a semitechnical sales force able to competently service the minor customer inquiries and complaints.

(7) Who performs a function that the manufacturer finds too costly to handle himself.

A manufacturer chooses a distributor to promote the sale of his products. The large national or sectional distributor who acts as a clearing house for the products of many competing manufacturers is not the answer. The smaller distributor, who aggressively pushes his suppliers' products in his particular locality, and who does not handle competitive lines, can, in the long run, serve the supplier to better advantage.

It is up to manufacturers to review their policy on choosing dis-

tributors to be sure that their distribution policy aids company growth.

We believe that this is the answer to most of the problems of chemical distribution cited in your article.

PETER E. TRUESDALE  
Truesdale Chemical Sales Co.  
New York

### Tax 'Amateurs'

TO THE EDITOR: The comment in your Washington Newsletter (July 4, p. 28) on proposals to tax nonprofit scientific laboratories may be somewhat misleading to the reader who is not thoroughly familiar with various publications of the National Science Foundation.

Interested readers would find valuable information in publications titled "Research and Development by Non-profit Research Institutes and Commercial Laboratories" and "Basic Science—a National Resource," both published by the National Science Foundation and available from the Superintendent of Documents, Washington 25, D. C. Both publications clearly outline the improper tax-exempt status of so-called nonprofit research institutes.

Business operations by co-operatives have only amateur status when compared with the tax inequity that exists in the case of research institutes.

LEWIS E. HARRIS  
President  
Harris Laboratories  
Lincoln, Neb.

### Self-Interest vs. Altruism

TO THE EDITOR: Paul Rykens, in his talk to the International Chamber of Commerce (*CW*, June 13, p. 9), gives sound reasons why private enterprise should be alert to the opportunities in the relatively underdeveloped areas of the world. But at the same time, he strikes some altruistic poses and uses some New Deal jargon that I find disturbing. Big business and big government are both run by managers who operate with other people's money, and neither has the right to indulge in philanthropies or altruism with money that is not their own. As managers they should be concerned with the long-term self-interest of the organization they are

## VIEWPOINT

THE CHEATING that goes on in the distribution of chemicals is pretty well outlined, we think, in the story that begins on p. 84 of this issue. It's not a nice story. And though we're sure that there are situations a good deal worse in other areas of industrial distribution, we in chemicals cannot afford to be complacent. The longer we put off a cleanup, the more chance that some headline-seeking congressman or bureaucrat will try to do it for us.

Policing chemical distribution is difficult—especially since a good job of policing might put a company or a trade association under strong commercial pressures or in jeopardy of antitrust violation.

What can be done? Here are some approaches:

(1) Setting up a chemical distributors' trade association. (There's a precedent here in the Institute of Chemical Distribution, which existed for a short time in the 1930s.) Violation of the code of ethics of such an organization would be cause for loss of membership.

(2) Establishing standards of identity for solvents, alkalis and other materials in large-scale commercial use. This could be done through the American Standards Assn., or, perhaps, under the sponsorship of the Manufacturing Chemists' Assn. or the new distributors' group.

(3) Individual manufacturers, too, might set up their own standards, and require their distributors to certify on their invoices that material supplied met the manufacturer's specifications.

(4) FTC trade practice rules might be written. (But the enforceability of such rules is questionable.)

These are certainly not all the ways that the problem can be tackled. We'd be happy to serve as a clearing house for other suggestions from readers. The cheating that goes on in chemical distribution is a threat to all of us as members of the chemical community.



Editor-in-Chief

SEPTEMBER



80%

## PROPYLENE CONCENTRATE

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# TB&C

Production facilities for 80% propylene concentrate are due on stream about September 1. This is the first time propylene has been made commercially available in concentrated form as a co-product from the Houdry dehydrogenation of butane . . . another first for TB & C.

TB & C's tentative specifications for this material are 80% minimum propylene concentration with propane making up the bulk of the remainder. For a reliable new source of propylene to fit your needs, call or write Texas Butadiene & Chemical Corporation.

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## OPINION

paid to manage. Any diversion of funds into other channels is a breach of trust.

Of course, long-term self-interest requires that business and government — as well as individuals — should be good neighbors who do their fair share in the community. But the costs should be considered as matters of self-interest, rather than philanthropy. Perhaps there will be little difference in practice, but it is important that we keep both our accounting and our ideas straight.

Let business managers be aware that the investments they make are such as will yield honest profits over the years, and recognize that a continuing profit is the ultimate proof of a needed service rendered.

Free enterprise operating at a profit that measures its long-range contribution to society is a potent stabilizing and civilizing influence. If operated in its own long-term self-interest, it should need no apologists. Improving the general welfare and raising the standard of living of people are important, but of necessity must be secondary to the business objective of making honest profits by supplying needed services.

Let's keep our aim on the primary target rather than on the uplifting of the world. After all, who wants someone else deciding whether he should be "uplifted" and by what means!

R. A. DUNCAN  
129 Wyoming Ave.  
Wyoming, O.

## Polish Addenda

TO THE EDITOR: In your story on polishes, a footnote states that our company recently launched a water-emulsion paste wax for use on wooden floors. In line with the recommendations of the Chemical Specialties Manufacturers Assn., the National Hardwood Flooring Manufacturers Assn., and such large building owners as the Metropolitan Life Insurance Co., we do not advocate the use of a water-emulsion product on a wooden floor.

The reason for our development of Preenet emulsion paste wax was that our market research indicated that a small number of housewives prefer, on occasion, to use a paste wax on asphalt or rubber tile. Of course, you

are perfectly correct in saying that this type of product is popular with contract cleaners, for it is, perhaps, the easiest for them to apply with their large rotary buffers. . . .

C. WALTER BUHLER  
President  
The A. S. Harrison Co.  
South Norwalk, Conn.

TO THE EDITOR: Your article "Polymers Shine in Floor Polish Picture" (*CW*, June 13, p. 117) admirably covers the various facets and changing picture of the self-polishing emulsion floor polish — with two exceptions.

In speaking of the substitutes for carnauba in your table "Trends in Floor Polishes," you fail to mention the original synthetic waxes derived from montan wax. Our "KPS" wax, unlike the waxes you mention, is as hard as carnauba. . . .

Second, you overlooked development of nonionic self-polishing emulsions. . . .

KURT J. WASSERMAN  
Vice-President and Technical  
Director  
Hostawax Co.  
New York

TO THE EDITOR: We should like to draw your attention to a small printing error in your very excellent article on floor polish. You mention our Duroxon J-324, but the name is spelled Duronox in your text. . . .

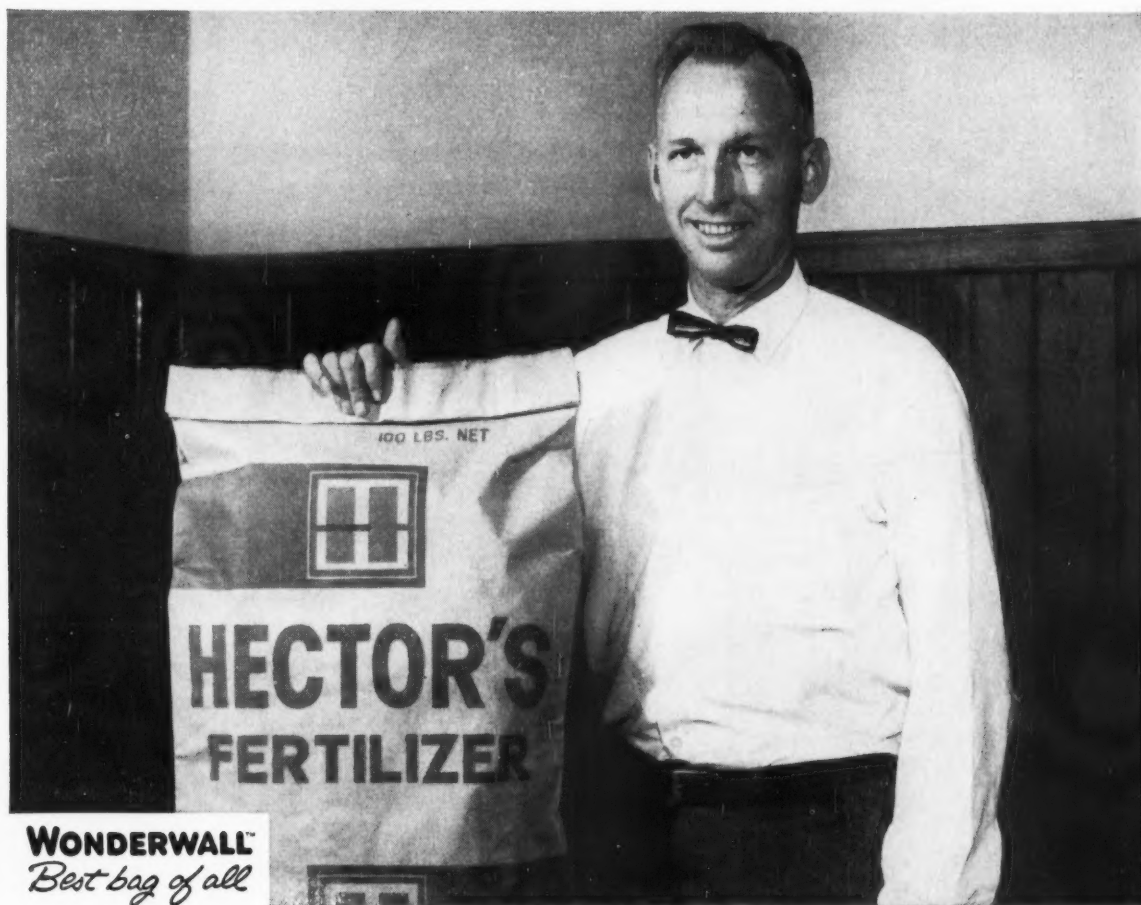
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## MEETINGS

**Gordon Research Conferences:** At Colby Junior College, New London, N.H.—elastomers, Aug. 10-14; food and nutrition, Aug. 17-21; instrumentation, Aug. 24-28; cancer, Aug. 31-Sept. 4. At New Hampton School, New Hampton, N.H.—inorganic chemistry, Aug. 10-14; analytical chemistry, Aug. 17-21; statistics in chemistry and chemical engineering, Aug. 24-28; chemistry of adhesion, Aug. 31-Sept. 4. At Kimball Union Academy, Meriden, N.H.—toxicology and safety evaluations, Aug. 10-14; chemistry and physics of metals, Aug. 17-21; photonuclear reactions, Aug. 24-28; molten salts, Aug. 31-Sept. 4.

**American Rocket Society and Northwestern University,** gas dynamics symposium, Northwestern University, Evanston, Ill., Aug. 24-26.

**“WONDERWALL<sup>TM</sup> saves us  
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*Robert C. Hector, President of Hector Supply Co., holds a cost-saving Wonderwall.*

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President Robert C. Hector found that West Virginia's WONDERWALL measurably reduced his company's bag costs, yet gives better service.

“We were packing 100 pounds of fertilizer in a sewn open-mouth multiwall of natural kraft. This was constructed of 1/90 AL, 2/40, and 1/50 for a total basis weight of 220#,” Mr. Hector said.

“When we switched to a WONDERWALL of 1/110 AL and 1/70 construction, we saved 40 pounds in paper basis weight, and that figures out to \$7.80 per thousand bags. Equally important, our bag breakage now is negligible”.

WONDERWALL bags are better because they're made with Kraftman Clupak\* paper, the tough, impact-resisting kraft with the built-in stretch—pioneered by West Virginia.

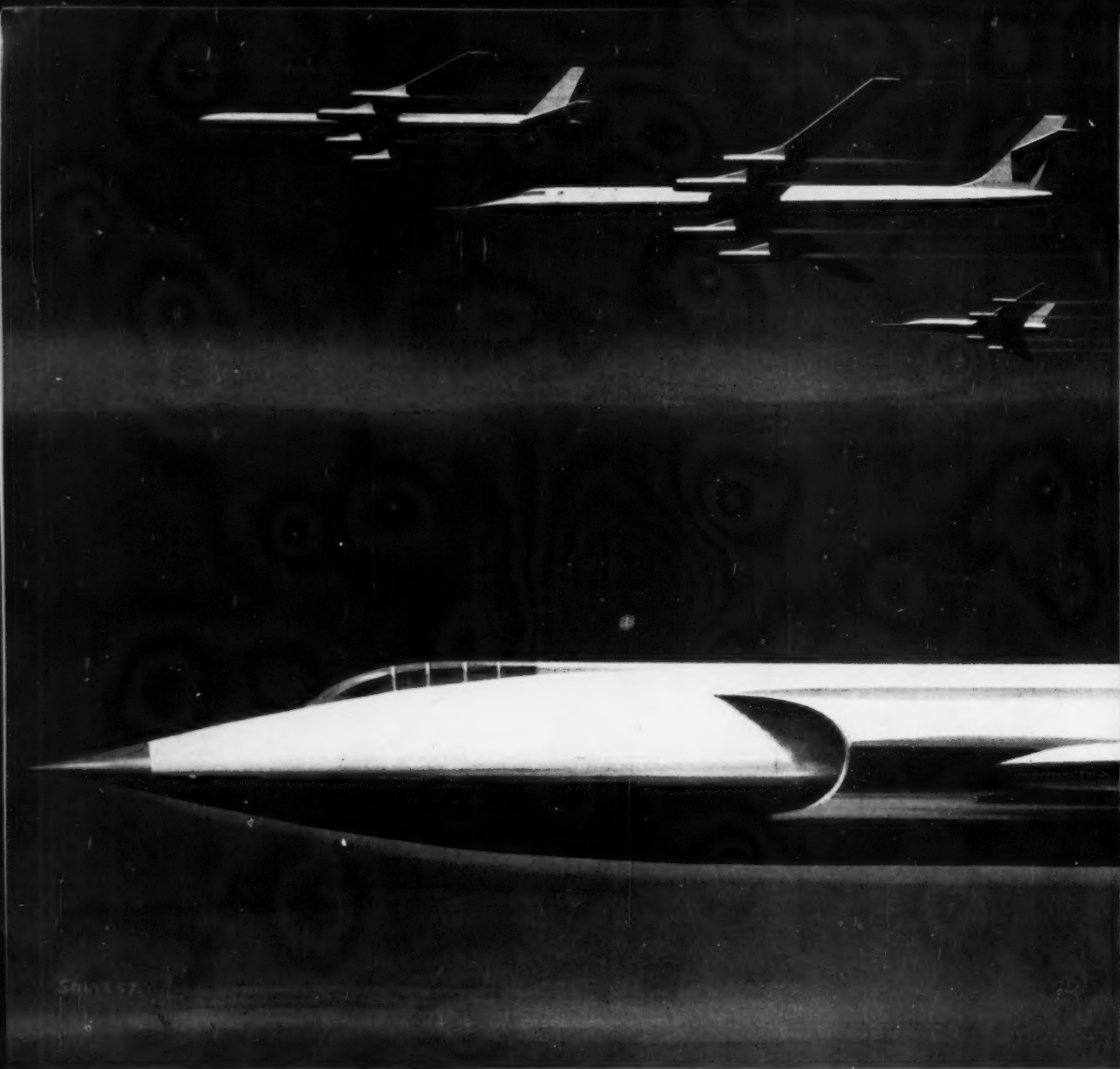
Packers of cement, feed, fertilizers, sugar, flour, and many other products are reducing bag costs substantially with WONDERWALL.

See how you can save money; we'll be glad to show you. Just write Multiwall Bag Division, West Virginia Pulp and Paper Company, 230 Park Avenue, New York 17, N. Y.

\*Clupak, Inc.'s trademark for extensible paper, manufactured under its authority.



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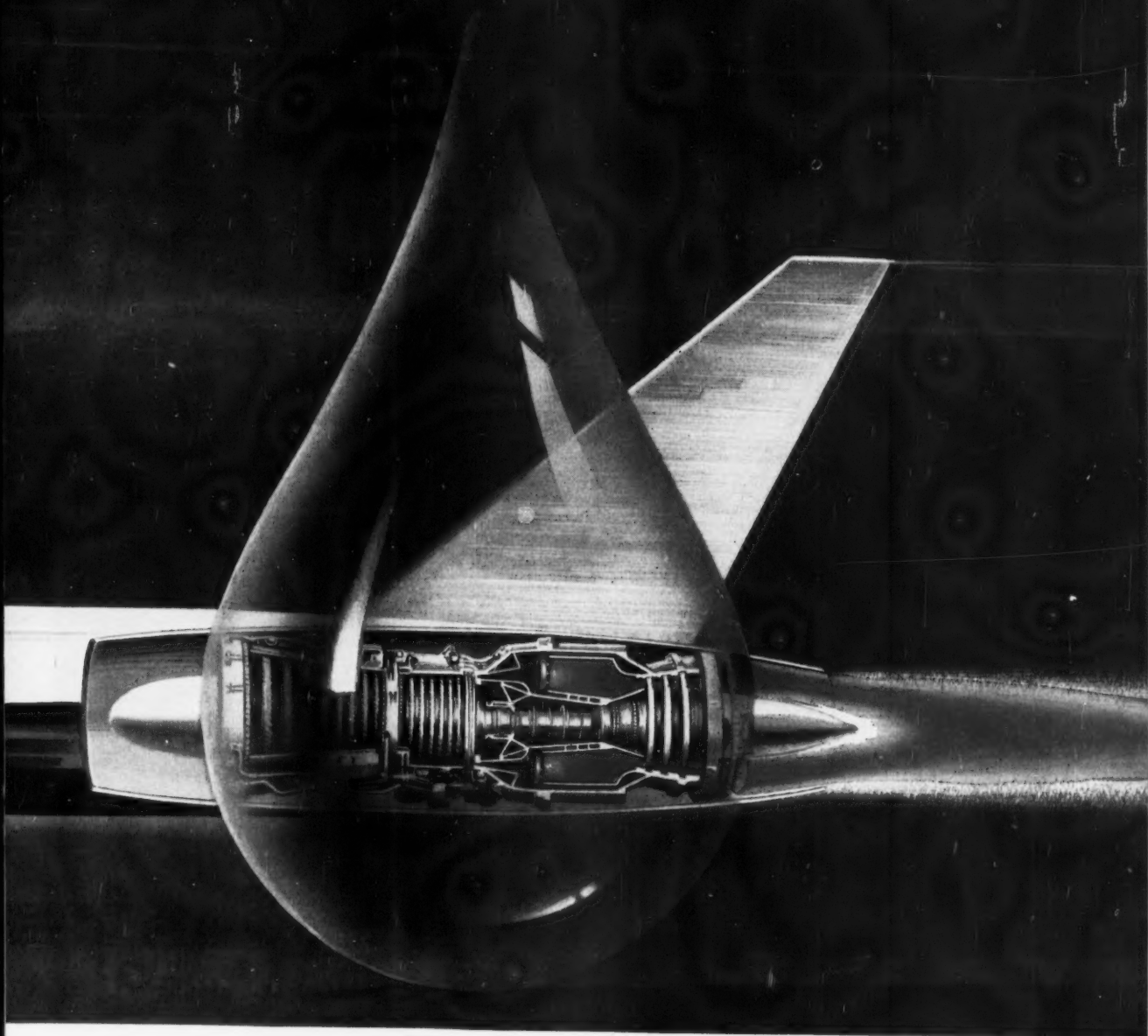


## Lube "breakthrough" by *Celanese*

New Celanese synthetic lubricants have hurdled the heat barrier set up by high bulk oil temperatures in jet engines. These lubricants withstand 425°F . . . more than 100° higher than any previously available. Highly significant, too, is the fact that they efficiently meet viscosity requirements at temperatures down to -65°F. Their potential has barely been tapped. For instance, they may become of utmost importance in such broad fields as heat transfer, automotive, and steel and aluminum forming. Continuing research and progress by Celanese in high-temperature lubricants has broadened and sharpened our national defense capabilities and has enabled great improvement in industrial machinery design. If you have a high-temperature lube problem, why not ask us to help? Simply write to

Celanese Corporation of America, Chemical Division, Dept. 552-H, 180 Madison Avenue, New York 16, New York.

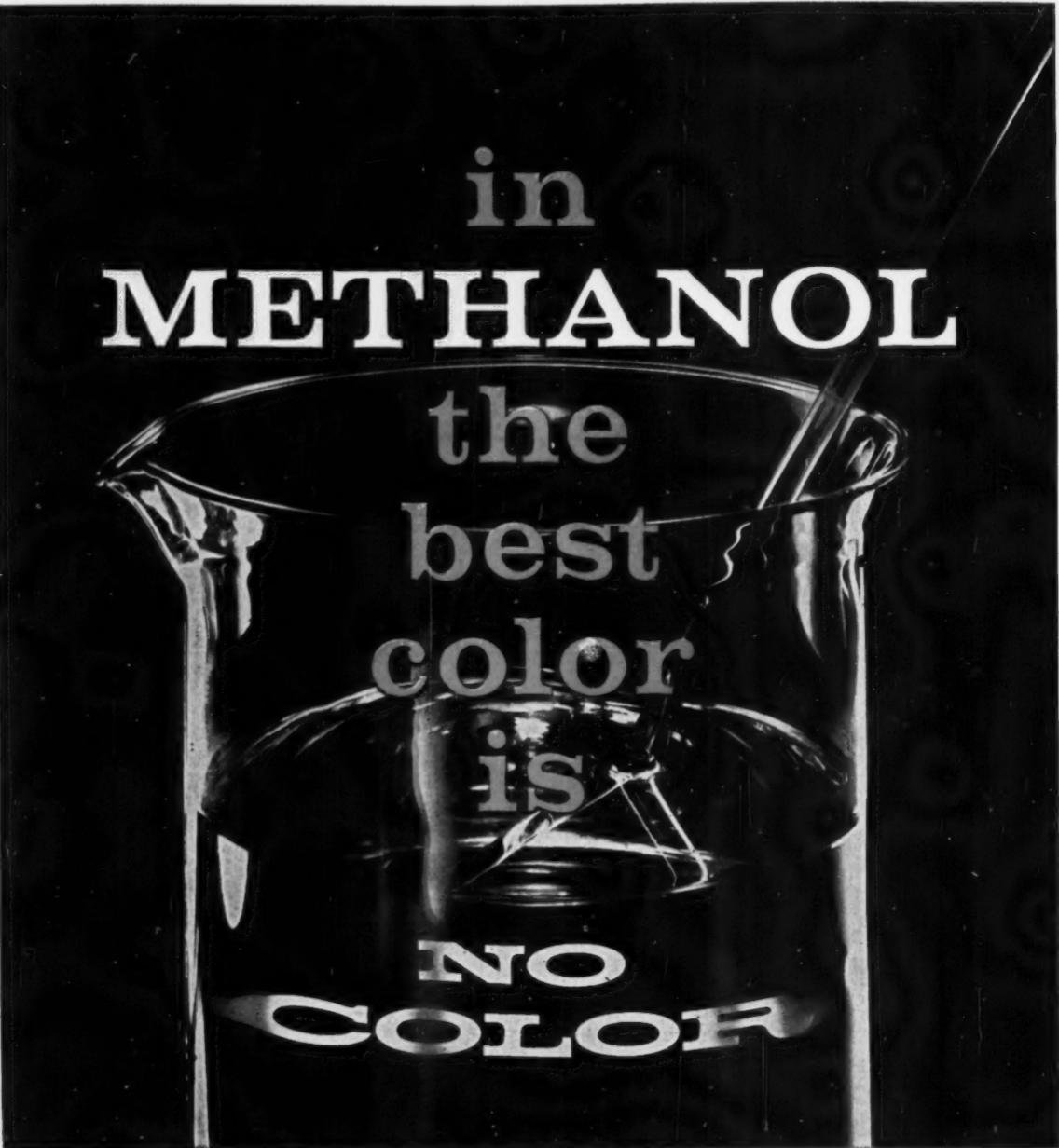
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Allied Methanol is shipped in barges, tank cars and tank trucks from the South Point, Ohio plant and from strategically located stocks in principal cities. Nitrogen Division's technical service staff is always at your call.

*For specifications and local offices, see our insert in Chemical Materials Catalog, pages 435-442 and in Chemical Week Buyers Guide, pages 35-42.*

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3819

# Business Newsletter

CHEMICAL WEEK

August 8, 1959

## A flurry of mergers highlights the news this week.

- Ever-growing Reichhold Chemicals will add to its assets its 18th plant in the U.S. and another in Canada by purchasing Varcum Chemical Corp. (Niagara Falls, N.Y.) for an undisclosed sum. Varcum, with facilities in Niagara Falls and Lindsay, Ont., produces a wide range of liquid, powdered and solid phenol-formaldehyde resins and compounds, some new to Reichhold's product lines.

- Thompson Ramo Wooldridge, producer of control instruments and equipment, is upping its stake in the chemical industry by buying controlling interest of Magna Products, West Coast producer of specialty chemicals and electronic instruments for the oil, gas and chemical industries. Magna plans a research program to expand its stake in petroleum and chemical production and processing.

- Dyna-Therm Chemical Corp. (Culver City, Calif.) is also broadening its horizons through a merger. It has acquired Plas-Kem Chemical Corp. (Burbank), vinyl plastisol and organisol producer. Dyna-Therm makes high-temperature protective coatings, aerosol paint, and other specialty products.

- Flintkote Co. is continuing its expansion into the cement industry—begun in '57 with its purchase of Kosmos Portland Cement Co.—by merging with Calaveras Cement Co. (San Francisco) through a stock exchange.

- International Minerals & Chemical Corp. has acquired Miami Fertilizer Co. (Dayton, O.) through a stock exchange.

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**Some effects of the steel strike are beginning to be felt by CPI companies:** e.g., Tennessee Products & Chemical has just laid off about 425 employees in its ferro-alloys plants, shutting down eight of its 21 blast furnaces because its steel company customers are not operating. But most chemical companies are still riding out the momentum of the first six months' boom (p. 24).

Late-reporting companies add more "new records" to the string of first-half peaks. Harshaw Chemical—whose fiscal year ends Sept. 30—boosted nine-month sales nearly 15% to \$52.1 million and elevated earnings 49.7% to \$1.9 million (including profit on sale of securities). Minnesota Mining & Mfg. weighed in with six-month sales of \$210.7 million (up 19.6%) and earnings of \$27.4 million (up 55.5%).

Victor Chemical's first-half gains: sales up 16% to \$30.35 million; earnings up 47% to \$2.5 million.

One exception to the rising-sales trend: Michigan Chemical, whose six-month sales dropped from \$5.4 million in '58 to \$4.6 million.

## **Business Newsletter**

(Continued)

Earnings, however, climbed by \$128,592 (including \$61,999 in non-recurring profit) to \$346,445.

**Chemical business in Canada, too, is up**—but not so sharply as in the U.S. Canadian Industries Ltd. reports six-month sales up 4% to \$76.7 million, net income up 7% to \$3.5 million. Du Pont of Canada scored an 11% rise in sales to \$44.5 million, and a more than 50% gain in earnings to \$3.7 million.

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### **Chemical companies are cautiously increasing capital outlays.**

Example: Monsanto's capital spending plans for this year now call for a \$12.4 million increase to \$85 million, vs. \$72.6 million last year.

Here's how the company has allocated its funds: \$60 million for parent company projects, \$12 million for those contemplated by foreign subsidiaries, and \$13 million as its 50% share of capital investment planned by associated companies. Planned for the parent company: larger capacities for new chlorine products, silica products and alkyl benzene; entrance into the field of ultrapure silicon, and expanded ammonia capacity to about 70 tons/day. Also, Monsanto will expand research facilities for petroleum additives, increase bisphenol A capacity and boost polyethylene capacity at Texas City to 100 million lbs./year.

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### **Two Canadian expansions are in the works:**

- Dow Chemical of Canada, Ltd. is testing soil with an option to buy in the Vancouver, B.C., area for possible construction of its previously announced phenol plant. Engineering for the plant is nearing completion.

- Visking Co. division of Union Carbide will build a polyethylene film plant about 50 miles southeast of Montreal—a 50% increase in its Canadian PE film capacity.

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### **And U.S. chemical firms are expanding abroad** at a quickening pace.

Foreign capital expenditures by such companies are up 14% this year to \$203.5 million, according to a new survey by the McGraw-Hill Dept. of Economics. Despite economic and political hazards in Latin America (p. 20), U.S. companies will invest about \$40 million there, about the same as last year.

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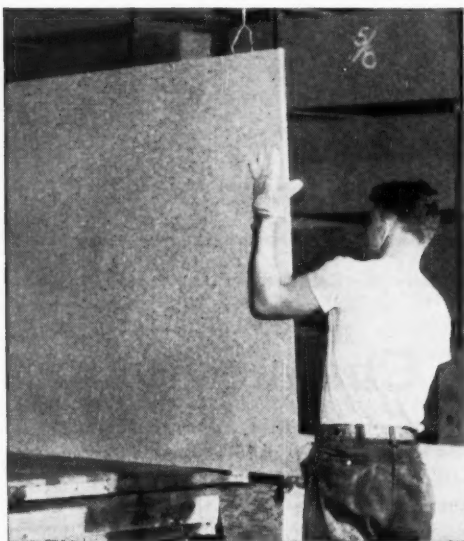
### **Also in South America**, Imperial Chemical Industries (London) will put up \$4.2 million toward a \$6.58-million expansion program of its subsidiary, Industrias Químicas Argentinas Duperial, S.A.I.C., Buenos Aires. Units included: sulfuric acid, carbon bisulfide, hydrogen peroxide, phthalic anhydride. The project is subject to British government approval.

# HOW **HERCULES** HELPS...



**PACKAGE GLAMOUR TO PERFECTION**—Pro-fax®, Hercules polypropylene, does it in this striking new aerosol container for Coty Spray Cologne. Called Petite Mist, it's available in four enchanting fragrances, in a choice of two eye-catching color combinations . . . either jet black or snow white, richly decorated with

gold. Especially designed as a sturdy, lightweight travelling accessory, Petite Mist is equally at home in the most delicate feminine boudoir. For this truly modern package, Coty naturally specified Pro-fax—the truly modern plastic. Economical Pro-fax can live up to the most imaginative designer's expectations.



## MODERN BUILDING TECHNIQUES

—Particle board used as core stock in kitchen cabinets and plywood partitions as well as for floor underlayment relies on Paracol®. This Hercules wax emulsion adds water resistance and increases dimensional stability of the board. Paracol treated board has less tendency to warp, can be sawed more readily, holds nails firmly.

## HOTELS "LOOK LIKE A MILLION"

—Multicolor lacquer enamel was the finish chosen inside and out by the multimillion dollar Hotel Pierre Marques in Acapulco. An attractive, tough, durable finish, it constantly withstands ocean spray and high humidity. Multicolor lacquer is available under different brand names from many paint manufacturers.



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**CHEMICAL MATERIALS FOR INDUSTRY**

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G59-5



As seen by UN experts: political, economic factors barring the way to chemical industry development.

## Latin America's Bottled-Up Chemical Boom

By 1965, Latin America may be using yearly some \$4.5 billion worth of chemicals; 10 years later—by '75—demand could swell to \$8.2 billion. But unless there is a drastic change in the local economic situation, U.S. producers exporting to the area or even setting up plants there will only be able to nibble around the edges of this juicy market.

This is the tantalizing picture high-

lighted by a United Nations report issued last week.

**Long Way to Go:** So far, the U.N. report notes, the Latin-American chemical industry has concentrated mainly on consumer goods—toiletries, soaps, matches, oils, and fats—and has done little in intermediates. But demand is fast rising for plastics and synthetic fibers and for agricultural chemicals like synthetic fertil-

izers, insecticides and fungicides.

This demand stems largely from growth in other industries. Motor vehicle production demands rubber and carbon black; textiles consume a mounting volume of detergents; the metal-working industry needs abrasives; the mining industry, explosives. And general economic development is resulting in a rapidly rising demand for alkalis and acids.

To fill these needs, the chemical industry itself will have to boost its chemical intake. Despite the glittering prospects, the U.N. report states, progress toward meeting these needs domestically has been "very limited" in most fields. There are exceptions, such as the development of a plastics industry in Brazil and fertilizer plant construction in Mexico. But many basic areas are lagging.

To meet the projected '65 demand with present capacity, Latin-American chemical imports would have to reach about \$1 billion/year.

Petrochemical development has been creeping along in oil-rich Venezuela, and making even slower progress in Argentina, Chile, Colombia and other countries.

Alkali production, especially soda ash, is in still worse shape. Latin America still imports almost all its sodium carbonate needs, and is only partly self-sufficient in caustic soda. Natural soda ash is produced in Chile and Mexico, but it's "of secondary importance." Colombia's Solvay plant is also small. Brazil's plant, many years in preparation, won't be in operation until '60, and Chile's plant—designed to make the country self-sufficient—has been in the works for 10 years.

Moreover, the report asserts, schemes for producing basic materials for synthetic fibers and for making synthetic rubber "have generally not passed beyond the preliminary planning stage," while carbon black production has only recently begun.

**Rich in Raw Materials:** These lags are certainly not due to any lack of chemical raw materials. Large reserves of petroleum exist in Venezuela, Mexico, Argentina, and Chile. Natural gas is also abundant and probably holds best prospects for the chemical industry. In '56, proved reserves in Latin America totaled 10 trillion cu. meters—50 billion in Argentina, 760 billion in Venezuela, 180 billion in Mexico, and an estimated 14 billion in Chile.

Output of refinery gases has been limited by the slow development of refineries. Most are "simpler operations" which produce small quantities of gas not ideal for petrochemicals.

Supplies of ethylene, propylene and butylene are in some cases large enough to supply small national markets, but would not fill the needs of an integrated, large-scale industry. Venezuela and Mexico may develop such large-volume supplies over the next decade.

**Petrochemical Needs:** Development of petrochemicals is especially important in filling the region's needs because of insufficient supplies of coking gas and coal-derived benzene.

For electrochemical development, the report predicts that important low-cost hydroelectric resources may well be discovered in Argentina, Brazil, Chile, Mexico, Venezuela, and elsewhere in Latin America. Moreover, thermal electrical generation based on natural gas fuel is feasible in Chile, Mexico and Venezuela. And all of these countries have enough salt and limestone to feed an electrochemical industry.

The U.N. document is actually a brief report on a survey in progress. For a sharper picture on the chemical industry's status and prospects in South America, here are some close-up reports from *CW's* on-the-scene correspondents.

**Argentine Advances:** While no sales figures are available in Argentina, trade circles put a \$210 million value on '58 chemical output. Official statistics peg the output rise at 2.7%, compared with an 8.5% rise in '57. Business observers attribute the lag to strikes and slowdowns (*CW, April 18, p. 40*).

Argentine observers see "unprecedented" medium- and long-term prospects for the chemical industry. So do many foreign companies, which have poured more than \$80 million into the industry during the '54-'58 period. Last year alone, some \$58 million—mostly from the U.S.—was firmly pledged, and an additional \$96-123 million was offered by Texas Butadiene and Fish International for petrochemical projects.

Biggest growth is planned for petrochemicals, although Koppers, Monsanto, Fish International, Texas Butadiene, and Hydrocarbon Research so far are the only companies to express

interest. To spur petrochemical progress, the Argentine government is offering tax exemptions and other privileges to firms producing synthetic rubber, fertilizers, vinyl, carbon black, polyethylene, polystyrene, and detergents. One taker: Hydrocarbon Research Co. of Texas, which has revealed the latest petrochemical plans, a \$10-million ammonia and ethylene plant.

Aside from petrochemicals, the most important products not produced locally are soda ash (yearly requirements: 80,000 tons), caustic potash and potassium carbonates.

**Imbalances in Brazil:** In Brazil, there are no official sources on the volume of chemical output, and industry is relatively diversified and rapidly growing. Shortages of even the chemicals produced locally persist, and although Brazil is rich in raw materials, they are not only poorly exploited, but to a considerable degree even unexplored.

The industry's irregular development has caused excess production of many chemicals like sulfuric and hydrochloric acids, chlorine and alcohol, along with shortages of heavy-consumption products like caustic soda and soda ash. (The government's CIA. Nacional de Alkalis is due in production this year, and with smaller private producers will fill the caustic-soda ash gap).

Brazilians make no official investment figures available. But cautious estimates put the outlay for the past five years at about \$350 million. This year's investments are expected to total some \$50 million. U.S. capital accounts for about 35% of investments.

Petrochemicals are probably the most promising area in Brazil's chemical industry. There are, however, problems: Most of Brazil's present and future refinery capacity is controlled by Petrobras, the government-owned petroleum monopoly. Prospective investors might hesitate to depend on the politically sensitive organization for their raw materials, although observers admit that so far Petrobras has carried out its commitments.

**Variety of Needs:** Elsewhere in

South America, chemical output is growing, but a variety of needs remain. In Venezuela, promising markets exist in water- and metal-treatment chemicals and plastic resins.

Chile has to import starch, glucose, dextrine, antibiotics, insecticides, disinfectants and resins. Peru needs pharmaceuticals, dyes, calcium carbide, acetylene and alkalis. Fertilizer and petrochemical development is being pushed in Colombia.

Bolivia has petroleum, but no petrochemical industry; its requirements include alkalis, fertilizers, tannin, and pharmaceuticals. Uruguay also needs fertilizers.

**Need for "Common Market":** Added up, these chemical requirements are substantial. Yet, in the present situation, producers will be able to take full advantage of few of them, because they represent not a single market, but a number of small markets that cannot support large-scale chemical plants competitive with U.S. and European producers. This is the dominant theme of the U.N. report.

The need for consolidation of Latin America's chemical industry—if it is to compete with foreign production and aid the economy—is clearly pointed up by the U.N. group's study of 34 chemical products. Given the benefits of unified development, production costs would be higher than U.S. prices for only two of the chemicals studied. And the costs of all but four of the rest would be at least 30% lower than the respective U.S. prices.

Without a regional common market, such cost levels would be rare. In Brazil only seven of the chemicals could be produced at costs 30% lower than the U.S. price; in Argentina, only five; in Mexico, only 12, out of the total 34 examined.

But the lack of a common market will not mean an open door to chemicals from the U.S. The Latin-American nations are determined to industrialize; they will build plants even if they have to support them with high tariffs. And U.S. exporters can expect their share of the Latin-American market to decline as Europe reasserts its old position, bolstered by the large-scale production advantages that will result from the European Common Market.

**In the Works:** The first, halting steps toward setting up Latin-American common markets are being

taken. In Central America, a five-nation pact was ratified early this year, but the members have done nothing to reduce tariffs or other trade restrictions — as called for in the treaty — and have exempted long lists of important commodities from the tariff-reducing schedules. But the plan may get under way next year, as part of a larger scheme for planned regional development.

In South America, a common market plan is being worked out by Argentina, Brazil, Peru, Uruguay, Chile, Bolivia and Paraguay. It's a 10-year scheme to achieve tariff-free interzonal trade; 25% of the total tariffs would be eliminated within three years, 50% in six years, and the rest by the end of that period. But no one is very much excited about it. Unlike the European Common Market, each government would retain the power to bargain individually over products to be freed of tariffs and to what extent. South American businessmen see it primarily as a multilateral instrument for smoothing trade among its members.

One snag is already apparent. The proposed member-nations are still insisting on first erecting high external trade protection, and then reducing internal restrictions — precisely in reverse of the European Common Market procedure.

As members of the General Agreement on Tariffs and Trade, the Latin nations must clear common market plans with GATT. And other GATT members are insisting that the Latin plan include an eventual shift to lower tariffs for intercontinental trade.

Perhaps the biggest block to forming a genuine common market are traditional, nationalistic feelings. Each nation is determined to industrialize, and insists on protecting its young industries (*CW*, July 25, p. 65).

In Europe, industrialists in each country are firmly established, and can see the advantages of broader markets. But in South America, there is today no immediate basis for a common market. Most trade is external—raw materials going out, industrial products entering.

In the case of domestically produced industrial goods, these are often little cheaper than imports, because they are themselves made from imported materials. Moreover, internal

transport is much less developed than intercontinental shipping, so higher freight costs are seldom offset by the economies of local manufacture.

**The Way Out:** Clearly, there is no simple way to break down the barriers that stand in the way of realizing South America's vast potential.

Long-range thinking and cooperation on the part of the South Americans themselves, everyone agrees, is a must.

Yet, the basic problem lies deeper. It is the very fact of the continent's underdevelopment. It manifests itself in the nation's dependence on a narrow range of raw-material exports, which fall prey to shifting world markets and create economic instability. It shows itself in the dependence on high-priced imports, which helps stimulate inflation, along with competition between the public and private groups for a large share of limited resources.

Investments have been moving into South America at an impressive rate. Production is rising — sometimes faster than in the U.S. Yet, population is also rising rapidly, with the result that per-capita income tends to stick at its low level, holding down the demand that could attract more industry. And, with population growing so fast that it will triple in 40 years, national outputs will have to rise dramatically just to keep up.

The U.S. government has become convinced that large-scale economic assistance is necessary to break through the hardened crust of underdevelopment, help pay for the underpinnings of an industrial economy. An important step in this direction is the Inter-American Development Bank, which has been okayed by Congress but which must still be ratified by the Latin republics. And, if Congress approves increases in the Development Loan Fund, it will mean more U.S. aid for Latin America.

But some observers believe that this should be only the beginning, that massive assistance on the scale of the Marshall Plan will be needed to rescue Latin America from the rising flood of population.

Latin-Americans are determined that they will solve their problems. If they solve them with the aid of the U.S., the country can expect to share in the resulting prosperity. Without our support, they might turn to others—such as Russia.

## MH-30 in New Fight

Conflict over a plant growth-regulating chemical has broken out on a second front. Maleic hydrazide formulations—previously under attack in the flue-cured tobacco-growing regions in and around North Carolina—are being assailed in the burley tobacco area centering in Lexington, Ky.

To U.S. Rubber Co.'s Naugatuck Chemical Division—which has invested more than 15 years and substantial funds in research, development, field testing and evaluation of commercial usage—continued criticism of this product means sharply increased marketing costs. Naugatuck and various formulators have been conducting a series of more than 90 lectures and field demonstrations in the flue-cured tobacco belt this summer (*CW*, June 20, p. 62), and now a similar educational campaign is being launched in the burley tobacco areas in response to the new assault.

Naugatuck strongly disputes the assertion that use of the chemical "produces a less palatable smoke." Says Naugatuck: "Maleic hydrazide (MH-30), when used in accordance with latest recommendations, will produce burley tobacco that is equal in quality to that of hand-suckered tobacco; and this tobacco will not differ significantly in taste or aroma."

## Southern Sights Profit

**Southern Nitrogen Co.** (Savannah, Ga.) has trimmed its total capital deficit to a little more than \$1 million and may be able to wipe out that deficit about one year from now.

The company—organized late in '54 and in production since '57—this year increased its first-half sales 32.6%, to \$5.8 million, and its first-half earnings 22.6%, to \$470,521. These figures were published in a preliminary prospectus issued in connection with a secondary offering of 136,400 shares of the common stock. Total first-half net, including tax-loss carry-forward benefits: \$1.1 million.

The common stock to be offered to the public this month by underwriters headed by Harriman Ripley & Co. (New York) is being sold by 37 trusts, corporate and individual stockholders.



Flames billowing 500 ft. destroy Connecticut chemical tank farm.

## Fires Mar Safety Record

**Three chemical plant explosions—one each in New York, Texas and Connecticut—within eight days have marred the industry's safety record.**

Most spectacular of the three: the fire and series of blasts that destroyed the tank farm of Philipp Brothers Chemical Co. at Portland, Conn. Thirteen large tanks, containing various plasticizers, alcohol and other solvents, blew up shortly after a fire of undetermined origin was discovered at about 3 a.m., July 30.

There were no injuries during the worst of the conflagration, but hours later, 10 firemen sustained burns when a barrel of acid exploded. They were treated at a local hospital and dismissed. A nearby business house was also destroyed, and a score or more of families from nearby homes were evacuated until later in the day. An estimated \$250,000 worth of industrial chemicals burned up.

A spokesman for Philipp Brothers—said to be one of the largest chemical distributors in the East—said a new tank farm will probably be built, possibly at the same location. Meanwhile, he said, customers are being served from the company's storage facilities in Boston, Providence, New York, New Jersey and Philadelphia.

At Orange, Tex., the night of July 25, an explosion and flash fire at Du Pont's Sabine River Works severely burned two senior operators and caused a shutdown of the methanol section's hydrogen unit. Plant officials were investigating the cause of the explosion, which occurred during a heavy rainstorm.

The two operators, thrown into a discharge-water drainage ditch about 15 ft. from the hydrogen unit, were taken to a local hospital. The explosion reportedly ruptured piping and caused other equipment damage in a 40-ft. square area.

At Niagara Falls, N.Y., on July 22, a 38-year-old maintenance electrician was killed and two other employees were treated for shock after an explosion in a building used to manufacture chlorinated organic chemicals at the Hooker Chemical Corp. plant. Plant damage was estimated at \$200,000. Hooker said other operations at the plant were not affected, and that warehouse stocks of chlorinated organics could supply customers until the damaged unit is started up again, probably late this month. The blast demolished a 50x-100-ft. concrete block building, broke windows in other plant buildings.

# Ringing Up More Records

**It's now nearly unanimous. With most of the returns in, almost all companies in all branches of the CPI are reporting peak sales and earnings thus far in '59, with prospects deemed good for the rest of the year.**

In industrial chemicals, smaller and medium-sized companies have been making gains proportional to those racked up by the larger concerns (*CW*, Aug. 1, p. 21). For example, Atlas Powder's first-half sales were up 10% to \$34.9 million while earnings rocketed 48% to \$1.9 million. And Carwin Co. boosted first-half sales more than 50% to \$1.6 million, realizing a profit of \$53,000—which is \$2,600 more than net income for all of 1958.

Catalin Corp. raised its sales 12.5% to \$11.2 million and its net income 5.4% to \$106,793 for the first six months. Commercial Solvents pushed sales up 14.3% to \$32.5 million and earnings up 85.7% to nearly \$1.4 million. Cowles Chemical hoisted six months' sales 17% to \$4.2 million and earnings rose by 91% to \$124,270. Still another to achieve record six-month levels: Interchemical Corp., with sales up 16.9% to \$62.1 million and net up 82.5% to \$3.35 million.

**Spencer Scores on Plastics:** Spencer Chemical boosted both sales and earnings by more than one-fourth during the fiscal year ended June 30. Sales rose to \$57.6 million and net income for the year was nearly \$5.2 million.

President Kenneth Spencer reports improved performance in all product lines, but notes a particularly strong rise in plastics sales. This line accounted for 38% of sales.

**Pharmaceuticals Still Booming:** Reports from 15 leading concerns—including five out last week—confirm that the pharmaceutical industry is still in a vigorous growth period, although for some companies profit margins have started to flatten out.

Allied Laboratories (Kansas City, Mo.), however, made a 14.6% gain on earnings—to \$1.16 million—while sales for the first six months were up only 3.4% to \$15.4 million. Carter Products—whose fiscal year begins April 1—boosted sales 31% to \$15.3 million and earnings 61% to \$2.65 million during the April-June quarter.

McKesson & Robbins—also reporting on the first quarter of an April-to-March fiscal year—lifted sales 11% to \$160.9 million and earnings 25.9% to \$2.6 million. Cutter Laboratories' first-half sales and earnings are up 8.5% to \$10.8 million and 30.7% to \$621,000, respectively.

Merck & Co., had rung up record sales and earnings in the first six months of 1958, but did still better the first half of this year. Sales rose 9% to \$110.8 million, earnings 13% to \$15.8 million. However, the latter figure includes \$774,000 from favorable settlement of a tax claim applicable to prior years.

Plough, Inc. — which just last month completed three acquisitions in one day—estimated first-half consolidated sales up 6.9% to \$17 million and earnings up 13.6% to \$1.25 million. For Schering, the profit margin dipped again; while sales rose by \$514,000 to \$39 million, net income dropped by \$702,000 to \$5.2 million.

First-half sales and earnings for Smith, Kline & French were up 8.9% to \$66.8 million and 30.1% to \$12.9 million, respectively. Vick Chemical lifted sales 6.5% to \$114 million and earnings 19.2% to \$12 million. For Warner-Lambert Pharmaceutical, first-half sales were up 9.6% to \$87.6 million and earnings rose 19.9% to \$6.7 million.

**Semichemical Companies:** Companies that are basically in other industries but have large chemical interests shared fully in the boom. Eastman Kodak—whose sales of chemicals, plastics and man-made fibers continued to rise—reports total sales and earnings for the 24 weeks ended June 14 were up 13% to \$400.8 million and 41% to \$52.7 million, respectively. National Lead raised first-half sales 18.7% to \$264.5 million and net income 28.2% to \$26.8 million.

Oil companies with petrochemical investments chalked up new records. Standard Oil of New Jersey hefted earnings 26.5% to \$315 million; Texaco earnings rose 17.5% to \$162.7 million; and Phillips Petroleum pushed up net income 46% to \$53.2 million.

Two food companies that double in chemicals likewise posted new records. In its fiscal year ended May

31, General Mills raised sales 30.3% to \$546 million and net earnings 14.4% to \$16.8 million; a spokesman adds that sales of specialty organic chemicals "increased markedly." In first-half '59, Borden Co.'s sales and earnings rose 1.5% to \$456.5 million and 5.9% to \$11.9 million, respectively.

**Comebacks in Aluminum:** The principal aluminum producers—which last week agreed with the Steelworkers' union to continue their present wage contracts in effect until after the steel strike is settled—all came up with major gains during the first six months of this year. Aluminum Co. of America's sales and earnings were up 15.9% to \$424.9 million and 49.5% to \$28.9 million, respectively; but the net was still substantially less than in the first half of '57.

Reynolds Metals boosted sales 7.6% to \$239.5 million and earnings 2.9% to \$19.8 million, and Kaiser Aluminum & Chemical raised sales 16.6% to \$221.3 million and profits 11.7% to \$13.2 million. Olin Mathieson's aluminum operations are still in the red, with first-half loss of nearly \$3 million; but the company feels that future profits are assured as remaining facilities are completed and capital debt and startup costs are paid off.

Among equipment and engineering and construction companies, first-half business trends are mixed. Some achieved handsome increases, others registered setbacks. Allis-Chalmers—hit by a first-quarter strike—reports sales down 17.9% to \$221.2 million and earnings down 38.3% to \$5.3 million. Barry Controls booked 42% more new business than during the first half of '58. Blaw-Knox sales rose 5% to \$93 million and earnings mounted 35% to \$4.5 million.

For Combustion Engineering, sales inched up 1.4% to \$167 million, but net income slipped 6.8% to \$3.4 million. De Vilbiss Co.'s earnings rose nearly six-fold to \$481,837; and Fairbanks, Morse & Co.'s earnings soared from a \$106,890 deficit to \$906,795 in the clear. Foster Wheeler's earnings rose 34.4% to \$2.4 million, and Gardner-Denver boosted its net nearly 60% to \$3.5 million. Thompson Ramo Wooldridge earnings rose more than 20% to \$4.75 million; but Stone & Webster's net income dwindled 7.7% to \$4.7 million.

## COMPANIES

**McKesson & Robbins** stockholders, in their annual meeting last week at Baltimore, approved a two-for-one stock split and an increase in the authorized common stock from 2.5 million shares of \$18 par value to 5 million shares of \$9 par value. The shareholders also approved a stock purchase plan for employees and re-elected all members of the board of directors.

**U. S. Polymeric Chemicals** (Stamford, Conn.) common stock was marketed last week in both a new issue and a secondary offering. Of the 71,080 shares on the block, 56,080 were new shares offered by the company to its stockholders at a \$19.50 subscription price. The other 15,000 shares were sold by two of the principal shareholders, President Maarten Oudegeest and Vice-President William Thornhill, to the underwriters for resale to the public. Proceeds to the company are estimated at \$1.02 million.

**Imperial Color Chemical & Paper Corp.** (Glens Falls, N. Y.) directors have declared a special dividend of 30¢/share and are recommending a two-for-one stock split, subject to approval at the annual meeting of stockholders, Sept. 22. If the stock split is approved, the board plans to pay a regular quarterly dividend of 20¢/share, equivalent to a 14% increase. Of the present \$10-par capital stock, 1 million shares are authorized, 509,802 outstanding.

**Calcium Products Division** of Georgia Marble Co. (Atlanta) has opened a sixth plant to produce calcium carbonate pigment.

## EXPANSION

**Paint Resins:** The Glidden Co. (Cleveland) will build a \$600,000 unit for production of synthetic resins as part of its \$2.25 million expansion program. The unit is one of four approved by the Glidden board last week. All are expected to be in full operation by '61.

**PETN:** Canadian Industries, Ltd. (Montreal), is building a pentaerythritol tetranitrate explosives plant at its Beloeil, Que., works. The \$500,000 unit, said to be the first in Canada, will be completed next March.

**Refractories:** E. J. Lavino and Co. (Philadelphia) is planning a multimillion-dollar basic refractories plant in Gary, Ind. The new plant will give it installations close to all major steel and other metal producing areas.

**Chlorinated Hydrocarbons:** Ethyl Corp. of Canada will begin construction this fall on a major expansion of its gasoline antiknock compound plant near Sarnia,

Ont. Facilities will be built for Canadian manufacture of ethyl chloride and ethylene dichloride. Result: substantial reduction in imports after completion late next year.

**Kraft Pulp:** Celgar, Ltd., has awarded contracts for its \$50-million bleached kraft pulp mill at Castlegar, B.C., to Gilpin Construction Co., Henry J. Kaiser Co.

**Chlorine, Caustic:** Olin Mathieson Chemical Corp. will install modern electrolytic cells for production of chlorine and caustic soda in the Chemical Division's Niagara Falls, N. Y., facility.

## FOREIGN

**Sulfur/West Germany:** Stauffer Chemical Co. and Kali-Chemie A.G. have formed a joint company (Kali-Chemie-Stauffer GmbH.) and will build a plant at Hanover to produce a form of insoluble sulfur. It's due to start up next January.

**Vinyl/Australia:** B. F. Goodrich Chemical Co., together with local interests, will put up a \$4.5-million vinyl plant in Australia to "take care of all of the country's forecast needs . . ."

**Borax/England:** To counteract an expected rise in the price of borax and a flood of cheap enamel goods from Hong Kong, Britain's vitreous enamel and glass industries are petitioning the Board of Trade for a cut in the import duty of the raw material. The industries import most of their borax from the U. S.

**Phthalic Anhydride/Australia:** The Newcastle Chemical Co. plans to more than double its phthalic capacity, enabling the firm to cover the entire domestic market. The company is a joint venture of Imperial Chemical Industries of Australia and Broken Hill Pty. Co.

**Pharmaceuticals/Japan:** The Upjohn Co. and Sumitomo have set up Japan Upjohn Ltd. to make Upjohn's products in Japan.

**Pharmaceuticals/Egypt:** Three Swiss pharmaceutical makers—Ciba, Sandoz and Wander—are setting up shop in the Egyptian sector of the United Arab Republic. They have formed a jointly held company, Societe Swiss-Pharma, and plan to spend \$1.5 million on a new plant. Local private investors hold 40% of the stock.

**Natural Gas/Saudi Arabia:** The Arabian American Oil Co. is offering natural gas for industrial use—the first available in the oil-producing Arab states. About 163 million cu.ft./day will be available this year, with 214 million cu.ft./day expected to be on tap by '61.



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Bagpak Division **INTERNATIONAL PAPER** New York 17, N.Y.

# Washington

## Newsletter

CHEMICAL WEEK

August 8, 1959

**Congress has boosted Eisenhower's budget for medical research** 25%. The big increase from \$295 million to \$400 million for the National Institutes of Health is part of a generous appropriation bill that also pushed up funds for hospital construction 84% and sewage disposal plants 125%.

A veto is possible, but not likely. The President was prepared to accept a boost of about \$250 million for the Health, Education & Welfare Dept. The boost came to \$282 million—but with a saving clause that the President doesn't have to spend all the medical research money unless it can be used effectively. Eisenhower has claimed that there isn't enough medical research manpower available for that many projects. He may just accept the bill but not spend all the money. That's what happened four years ago when Congress doubled the money for cancer research.

As passed by Congress, NIH's appropriation breaks down this way: general research and services, \$46 million; cancer, \$91 million; heart research, \$62 million; mental health activities, \$69 million; dental health activities, \$10 million; arthritis and metabolic diseases, \$47 million; allergy and infectious diseases, \$34 million; neurology and blindness, \$41 million. Almost all of it will go into university and institutional grants.

•  
**The marked growth of the French chemical industry** may have important bearing on U.S. trade, says the Commerce Dept. What effect it will have will depend largely upon developments in connection with the European Common Market.

But French capacity to produce is worth noting. A new study by the department shows that the chemical industry is the fastest-growing sector of the French economy. Production increased 13% in '57 and 15% in '58. Expansion is expected to be substantial in sulfuric acid, calcium carbide, dyes, methanol, chlorine, plastics and petrochemicals.

•  
**Chemical firms are upset by proposed radiation protection rules.** The Atomic Energy Commission asked for industry comments on prospective regulations that would require employers to give workers regular written reports on their exposure to radiation. And lower, more strict ceilings would be set on permissible concentrations of certain radionuclides in air and water to which the general public is exposed.

Industry fears the result will be labor troubles and unnecessarily high costs. Mallinckrodt Chemical Works, for example, says the exposure reports to employees "would be useful in damage claims" against industrial users of radioactive materials "even though the licensee has fully complied with the standards."

Allied Chemical Corp. objects, claims the new standards would force it to abandon present practices of discharging wastes in an effluent

## Washington Newsletter

(Continued)

stream, and force it to keep a continuous waste storage of 3,000 drums. The hazards of handling the drums would constitute a new danger to workers, it says.

**AEC also is getting tough on uranium processing mills.** Five mills have submitted plans for bringing their operations into compliance with waste disposal regulations. Now the commission has advised the companies that compliance with the plans is a condition for continuance of their licenses to possess and process uranium ores.

•  
**A new power of investigation for the antitrusters** is now up to the House of Representatives, although House action is not likely this session. The Senate last week approved a bill, originally recommended in '56 by President Eisenhower, to give the Attorney General a new weapon, called a civil demand.

The legislation would allow the Attorney General to compel companies to produce documents he wants to conduct civil investigations of possible antitrust violations. A company could go to court to either limit the scope of such a demand or have it set aside entirely.

The Senate approved an amendment by Senator Dirksen (R., Ill.) that allows a company to go to court to object to having certain documents turned over by the Attorney General to Congressional committees. The idea is to prevent secret processes, developments, research or any privileged material obtained under a civil demand from getting into the hands of a committee.

The bill's Senate sponsors—led by Estes Kefauver (D., Tenn.)—wanted to leave it up to the Attorney General himself to decide what documents he could give to Congress.

•  
**Procter & Gamble's promotion of detergents** for automatic washers is under attack by the Federal Trade Commission.

In a complaint just filed, FTC charges P&G with both illegal restraint of trade and false advertising in the promotion of Tide, Dash and Cascade.

Main charge: that P&G, by signing allegedly exclusive, free-sampling contracts for Tide and Dash with every manufacturer of automatic washers, has gained a monopoly of this promotional method.

As a result of the exclusive contracts, says FTC, competing detergent manufacturers have been illegally hindered in using free sampling and receiving the prestige of manufacturer endorsement.

On false advertising, FTC charges P&G's detergent ads misrepresent the relationship between the washer manufacturers and P&G.

**Puzzled, P&G commented:** "... the complaint refers to contracts which no longer exist and to advertising which hasn't been run for many months. . . ."

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For accurately preparing extensive and comprehensive data on the chemical and physical properties, along with other pertinent characteristics of all Wyandotte products . . . their specifications and limitations.

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cation, handling and storage of our products.

*And equally important to you:* because technical service is deep-rooted and sincere at Wyandotte, technical assistance is readily available to you at raw material procurement, research, development, manufacturing, sales, and shipping levels. This also includes, of course, consultations with Wyandotte science-specialists\* on specific areas of product application.

Your request for assistance, accompanied by as much background data as possible, will put our facilities to work on your problem.

For a pictorial presentation of Wyandotte technical service at work, please turn page.

\*Chemists, Chemical Engineers, Physicists, etc., whose industrial or research experience qualifies them as specialists in their particular field.



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# Protecting the quality of liquid bleaches

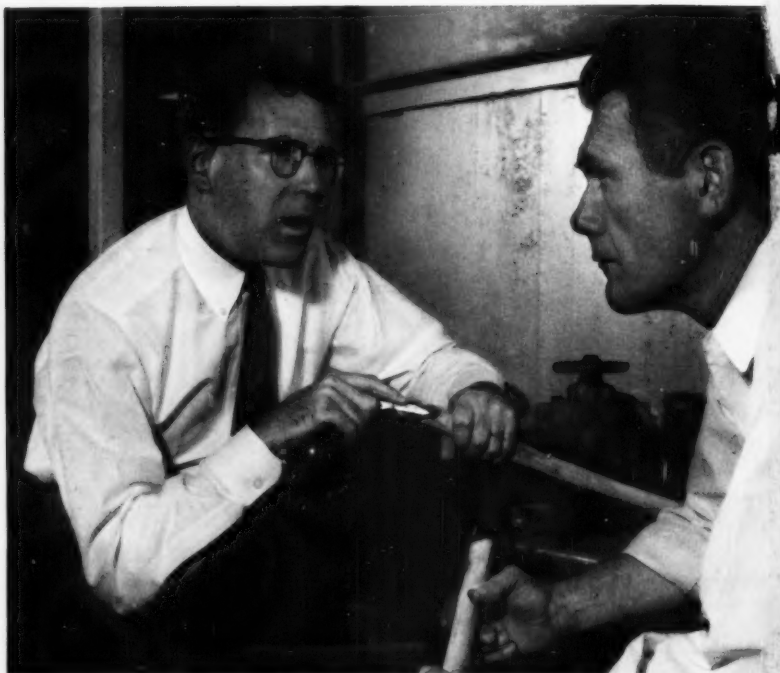


... an example of Wyandotte technical service at work



**1** A customer phones Wyandotte to report trouble with instability of his bleach. The technical-service man asks him to send samples of all the raw materials and finished products involved. These will be carefully tested in Wyandotte's laboratories.

**Q**UALITY MUST first be achieved... then protected and maintained. Wyandotte technical service can often be of assistance in both areas. And it's available to all Wyandotte customers. If you have a problem that falls within our technological or manufacturing background, check with us... our approach is designed to provide answers. *Wyandotte Chemicals Corporation, Michigan Alkali Division, Wyandotte, Mich. Offices in principal cities.*



**2** The laboratory tests indicate that a trace of impurity is at fault, so the technical-service man inspects conditions at the customer's plant. A thorough search revealed that this worn-out piece of equipment was causing the contamination.

## Wyandotte CHEMICALS

*Pacing progress with creative chemistry*



**3** A complete report is prepared and submitted to the customer. It covers the nature and cause of the contamination, and how to correct the process to prevent recurrence. A new piece of equipment was recommended, using new materials of construction.



**4** Wyandotte's recommendations are accepted. Several weeks later, the technical-service man and Wyandotte sales representative discuss progress with the customer over lunch. The customer reports a completely stable, contamination-free product.

# PRODUCTION

## Isopolyesters Join the Maintenance Team

The man pictured here repairing a refinery storage tank is indirectly playing a multiple role for Standard Oil Co. of California:

- He's helping develop new cost-cutting ways of keeping the Richmond, Calif., refinery at top efficiency. Some of these procedures are now standard practice—endorsed by Socal's board of engineers (*CW*, June 6, p. 85).

- He's helping enlarge the markets for isophthalic acid, on which these new resins are based. And currently, Oronite Chemical Co., a subsidiary of Socal, is major producer of this acid.

The two Socal operating companies have cooperated on this study of reinforced isopolyesters, which will be used in a technical report Oronite is currently preparing. The project, triggered by rising costs of maintenance and corrosion fighting, began about two years ago, with the Richmond refinery's engineering group, materials laboratory, and California Research Corp.'s isophthalic technical service group participating.

The jobs these isopolys were tested in are much the same jobs for which reinforced epoxy resins (and to a limited extent conventional reinforced polyester resins) are often suggested. The epoxies generally have been favored over the regular polyesters in spite of their higher cost, largely because of superior impact resistance and adhesion to metals. Also, still-more-expensive urethanes have found some application in these jobs. Now, Oronite says, the isopolys will give service as good as the epoxies, and are far cheaper. Oronite quotes typical coatings formulations at about \$6/-gal. for isopolyesters, about \$10/gal. for epoxies and about \$12/gal. for urethanes.

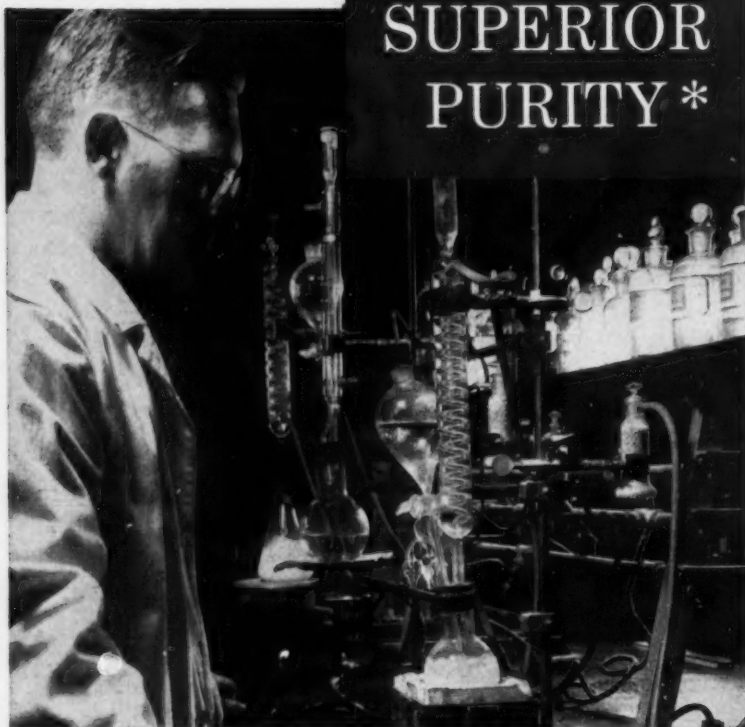
Here are some of the Richmond refinery's cost and performance records for repairing items such as storage tanks, pipes, tubes and valves:

- The cost of repairing tank bottoms is about \$1/sq. ft. (see chart, p. 35), is expected to drop as methods and equipment for applying the coatings are improved. Even at current cost levels, it is considerably cheaper than the \$3-4/sq. ft. cost of making



Socal worker sprays isopolyester, chopped glass onto tank bottom.

*To eliminate Uncertainty  
in lime operations  
standardize on this*



This delicate apparatus, specially adapted by "Mississippi" technicians, measures calcium carbonate content.

*\*Mississippi Lime Company's entire limestone deposits test 99% pure calcium carbonate . . . a natural purity and uniformity unequalled in such quantity anywhere.*

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By standardizing on "Mississippi" products, you remove uncertainty in lime operations . . . a step that can help solve production (and profit) problems.

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## PRODUCTION

tank repairs with steel plates. Also, repair downtime of 10 days for small tanks and 20 days for large ones is considerably lower than 30-90 days for repairing with steel plates.

For most companies, repairing a storage tank would be a specialized job. Coating application companies would be called in and labor costs would be considerably higher than those Socal has indicated. One applicator estimated that standard overhead items, including supervision, engineering, insurance and equipment depreciation, would make its labor costs about twice those of Socal. For many of the smaller jobs, regular maintenance crews would be used and costs would probably approximate those of Socal.

- The cost of repairing the webbing and seat of a corroded salt-water control valve with isopolyester patching compound was \$60; a new valve would have cost \$600. The repaired valve has been back in service for a year.

- Repairing a hole in a salt-water line with a redwood plug, isopolyester putty and isopolyester-impregnated glass cloth cost \$150. Repairs were made without reducing water pressure and the line is still in service more than a year after repairs were made. If the line had been shut down for repairs, downtime would have cost over \$12,000.

- Repairs made to an eroded wax deoiler tube have kept the tubing in service for over a year, saved over \$8,000 in tube replacement and several weeks' downtime.

**No Cure-All:** However, Socal emphasizes that isopolyesters are no corrosion cure-all. The use of pigmented isopolyesters as a substitute for conventional paints remains largely experimental. Moreover, complete corrosion data on many chemicals isn't yet available.

In some cases, Socal says, isopolyester coatings have some advantages over paint. Pigmented paints, for example, generally contain 50-75% solvent. Isopoly coating is described as "100% material," should give at least twice as much coverage.

**Another Advantage:** It is possible to deposit a coat of isopoly material that's thicker than that of conventional paint (reducing need for multiple coatings). The isopoly coatings are expected to last about nine years, com-

**DOW****SARAN LINED PIPE**

## **5 miles of pipe, 12 years of service**

**Saran Lined Pipe keeps process acids flowing!**

When five miles of process piping must carry an unfailing flow of highly corrosive acids, thorium salt solutions and slurries . . . when frequent flow changes require quick, on-the-spot pipeline modifications . . . that's when the extreme corrosion resistance and easy workability of Saran Lined Pipe make this process pipeline a process lifeline.

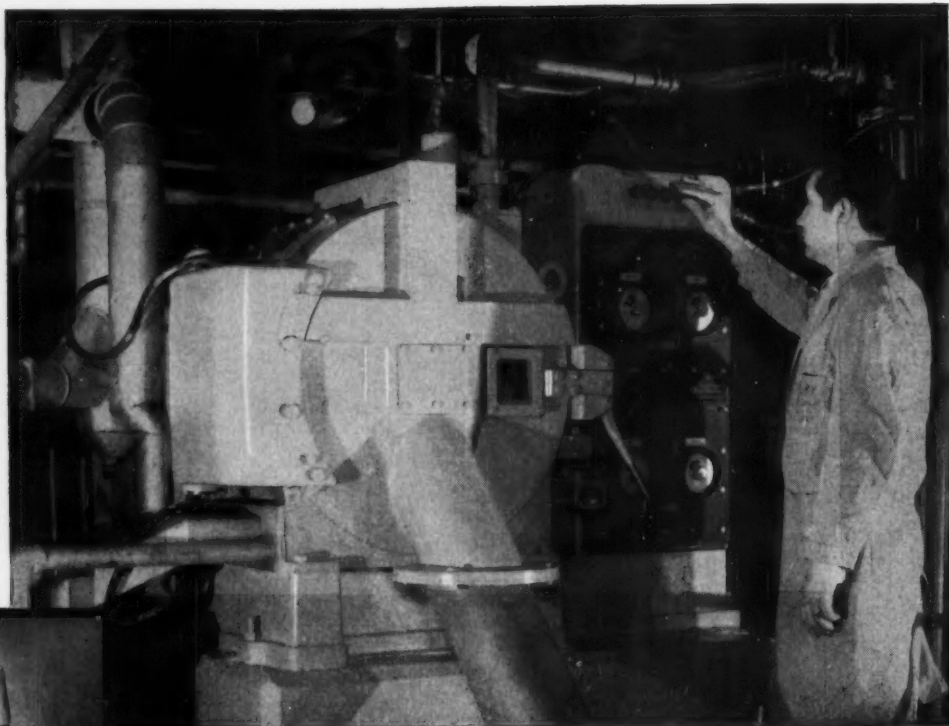
Above is one section of the approximately five miles of Saran Lined Pipe which carries process chemicals in thorium recovery operations at the American Potash & Chemical Corporation's Lindsay Chemical Division plant, West Chicago, Illinois. In this process, Saran Lined Pipe is required to carry highly corrosive materials: sulphuric acid slurries for ore leaching; reacted thorium sulphate solutions and waste slurries; concentrated hydrochloric acid, hydrofluoric acid slurries. The pipe network has been in constant use since

1947, and *there's never been a major process shutdown because of pipeline failure!*

Equally as important to Lindsay as corrosion resistance are the workability and strength of Saran Lined Pipe. The nature of the process requires frequent flow changes, meaning frequent changes in piping. Necessary pipeline modifications are done quickly and easily by plant personnel, cutting process downtime to a matter of hours. And high physical strength of the pipe minimizes the need for extensive pipe supports!

Saran Lined Pipe, fittings, valves and pumps are available for systems operating from vacuum to 300 psi, from below zero to 200°F. They can be cut, fitted and modified easily in the field without special equipment. For more information, write Saran Lined Pipe Company, 2415 Burdette Ave., Ferndale, Michigan, Dept. 2283AM8-8.

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## **ABBOTT LABORATORIES finds BAKER PERKINS HS Universal Filtering Centrifugal cuts costs and maintains high product quality of SUCARYL**

Since installing a Baker Perkins Centrifugal, Abbott Laboratories of North Chicago, Ill., has been able to triple its separation rate in the production of Sucaryl, its popular non-caloric sweetener. The B-P Type HS-20W Centrifugal now gets the same production in 8 hours that required 24 hours in the two batch centrifugals that it replaced. Since the centrifuge is totally enclosed, a high product quality has been realized. Operating on a 3 minute cycle, it produces a uniform moisture content crystal (18-20 per cent moisture) from a slurry containing 60 per cent solids. This uniform moisture is considered

very important in the subsequent drying operation. As in the case of Abbott Laboratories, Baker Perkins centrifugals mean unsurpassed efficiency and economy . . . B-P centrifugals are built in a wide range of sizes and types, so whatever your needs may be, there's a B-P unit to do the job. Why not have a B-P Sales Engineer recommend the proper size and type centrifugal for your application.

See our Insert in Chemical  
Engineering Catalog for  
additional information.



# **BAKER PERKINS INC.**

**CHEMICAL MACHINERY DIVISION  
SAGINAW, MICHIGAN**

359

### What it takes to repair 3,200 sq. ft. of tank surface with glass-reinforced isopolyester

Job	Man-hours	Labor	Materials cost	Total cost
Hauling and rigging	12	\$67.56	—	\$67.56
Sandblasting	51	287.13	157 bags of sand, \$110.25	397.38
Cleanup sand	16	104.15	—	104.15
Prime coat resin	18	101.34	55½ gal. isopolyester, \$187.59	288.93
Coal seams	34	141.42	41 gal. isopolyester and 41 lbs. Cab-o-sil, \$150.18	291.60
Spray resin and glass roving	88	495.44	303 gal. isopolyester and 1,068 lbs. chopped glass roving, \$1,472.70 <sup>a</sup>	1,968.14
Finish coat of wax-containing isopolyester	18	101.34	36 gal. isopolyester, \$121.68 <sup>a</sup>	223.02
<sup>a</sup> Cost of these materials not included in resin-system cost:				
			styrene, \$4.50	
			Lupersol DDM, \$1.80	
			dimethyl aniline, \$5.12	
			benzoyl peroxide, \$24.84	
			cobalt naphthenate, \$0.94	37.20
Total	237	\$1,298.38	\$2,079.60	\$3,377.98

### Comparison: isopolyester repairs vs. new sheet-metal tank bottom:

#### Cost

Isopolyester, \$1.05/sq. ft.  
Sheet-metal, \$3-4/sq. ft.

#### Downtime for repairs

Isopolyester, 10-20 days  
Sheet-metal, 30-90 days

pared with an average of five years for ordinary paints.

Corrosion data now available shows isopolyesters have a characteristic pattern similar to that of epoxy coatings. Isopoly coatings are claimed to have excellent resistance to concentrated phosphoric acid, 30 and 10% sulfuric acid and 10% nitric acid. Oronite says isopoly coatings have been applied to storage tanks containing various refinery stocks, cresylic acid and 50% ammonium nitrate. No data is available on its ability to resist the corrosive attack of bases.

**Formula Variations:** Oronite says isopoly compounds can be formulated with improved resistance to various chemicals. Present formulations strike a balance between high strength and chemical resistance properties. Formulas may range from flexible resins with high impact strength to rigid

resins with good chemical and high-temperature resistance.

**Starting Point:** The basic ingredients of the compounds are isophthalic acid, maleic anhydride and a glycol. Using a mixture of diglycols instead of a monoglycol or increasing the ratio of isophthalic to maleic changes the resin characteristics from rigid to flexible. (Longer chain compounds in the structure give a more flexible resin.) Socal uses a formulation designated CR 19583. This formulation has good acid resistance; temperature limitations are 180 F in continuous service, 250 F at peak.

Patching requires the use of glass-fiber reinforcement for strength. Glass cloth is used for small patching jobs; cheaper chopped glass on big ones.

**Toxicity:** Polyester resins are usually shipped in styrene solutions, often require the addition of styrene at the

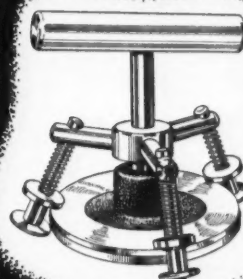
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A DIVISION OF VITRO CORPORATION OF AMERICA

## PRODUCTION

job site. As in epoxy resin application, gloves are worn to prevent contact with the skin. In applications within tanks, air masks are used to assure good ventilation.

## EQUIPMENT

**Deaerator:** Cleaver Brooks Special Products (Waukesha, Wis.) has a new deaerator that provides positive removal of dissolved gases from boiler feed water. The spray atomizing deaerator reduces oxygen content to less than 0.005 cc./liter, is available in standard sizes with capacities from 15,000 to 1 million lbs. Among the novel construction features of the new unit: a steam atomizing valve with low pressure drop; two-stage vent condensing with final counterflow; self-adjusting movable atomizing valve.

**Turbine Pump:** Allis-Chalmers Mfg. Co. (Milwaukee 1) has expanded its line of centrifugal pumps to 40 sizes of vertical short-coupled turbine-type units. The pumps are designed for cooling-tower, process, river-intake, booster, fire, drainage and dewatering services. Ratings: 20 to 8,000 gpm.; heads to over 400 ft.

**Plastic Filter:** A fiber-glass-reinforced plastic filter for process water is a new product of Proportioneers Division of B-I-F Industries, Inc. (Providence 1, R.I.). The filter, Model VFL, has flat, leaf-type elements, is of open-tank construction.

**Self-Draining Valve:** Jerguson Gage & Valve Co. (80 Adams St., Burlington, Mass.) is out with a self-draining valve having a special bolted bonnet said to guarantee perfect alignment and "freezeproof" action. The valve, designated No. 23, is suited to installations where the valve seat is inside the pipe or vessel wall. Valve pressures: up to 4,000 psi. at 100 F, 1,000 psi. at 750 F for ¾- and 1-in. sizes. The valve is also available in 1½- and 2-in. sizes.

**Rubber Spray Nozzles:** Spraying Systems Co. (Bellwood, Ill.) has a new line of hard-rubber atomizing nozzles for spraying corrosive liquids. The nozzles produce a hollow cone spray pattern; atomization is by hydraulic pressure alone. Range: 1 to 26 gal./hour at 40-psi. operating pressure.

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- higher aromaticity
- greater solvency
- high purity

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<b>TYPICAL ANALYSIS</b>	
Sp. Gr.	.8708
Gravity, °API	31.0
Weight, lbs./gal.	7.251
Color	Less than 0.001 gr. $K_2Cr_2O_7$ per liter of water; 30 + Saybolt
	110.0°C.
Distillation—IBP	110.8°C.
DP	0.04%
Paraffins	Less than No. 1 color standard
Acid Wash Color	105
K.B., Toluene	46°F.
Flash TCC	50°F.
Mixed Aniline Point	99.95+
Volume % Aromatics	Free of $H_2S$ , $SO_2$
Sulfur	

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CHEMICAL DIVISION

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from weather and temperature changes—to reduce trip time with improved bow design which lowers towing resistance.

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Refineries are now turning out prodigious quantities of tri- and tetramethyl benzenes. They're . . .

# Untapped Petrochemical Treasures

A visitor from Mars could easily jump to the wrong conclusion. If he had a rudimentary understanding of organic chemistry and the knowledge that petroleum aromatics are an important source of raw materials for the U.S. chemical industry, a glance at the aromatics produced in a typical reformer (*pp.* 40-41) might lead him to believe that the highly functional  $C_9$  and  $C_{10}$  aromatics are significant chemical building blocks.

They aren't, of course. But things are happening this week that could eventually make the Martian look smart. Sinclair has just started up a small commercial unit to make the  $C_{10}$ , durene (symmetrical tetramethylbenzene). Humble, a pioneer in petroleum aromatics in general, has a brand-new specialty fractionating unit; among other uses, it helps turn out tank-car quantities of the  $C_9$  and  $C_{10}$  aromatics. It has contracted with Enjay, its Standard affiliate, to find sufficient markets

to justify large-scale production. And in its soon-to-be-released revised Chemical Products Manual, it will list three derivatives of higher aromatics: trichloromethylmesitylene, monochloromethyldurene and bis-chloromethyldurene.

Shell has put considerable effort on durene and its derivatives, is prepared to swing into volume production as soon as the market warrants it.

And at least two chemical derivatives of polymethylbenzenes promise to go commercial. At Gibbstown, N.J., Du Pont is proceeding on schedule with its larger unit to make durene-derived pyromellitic acid (PMA) and its dianhydride (PMDA). Amoco Chemicals has been turning out trimellitic acid and its anhydride (TMA) since last September, is bullish about the compound's future.

**Ready to Go:** Other refiners and chemical companies are showing varying degrees of enthusiasm about pros-

pects for the polymethylbenzenes. Oronite, which has had samples of durene and pseudocumene available since 1950, is optimistic. Indiana Standard has amassed a stock of know-how about these products—even excluding Amoco's work on PMA—but is not now actively pushing them. It would be an eager producer, however, should markets develop. Richfield says it is "interested"—but on a long-range basis.

A number of chemical companies are known to be studying derivatives of the higher polymethylbenzenes, but most of the work is in a fairly early stage. Minnesota Mining & Manufacturing's L. A. Errede is investigating polymerization by pyrolysis of compounds such as xylene, pseudocumene, durene and isodurene. It's sponsoring work on the subject by M. Szwarc of Syracuse University's College of Forestry.

Diamond Alkali and Pennsalt have

## CW Report

been actively developing chlorinated derivatives of methylbenzenes. For the most part, however, they have been concentrating on xylenes rather than the tri- and tetramethyl compounds.

### WHERE FROM, WHERE TO

Like benzene and the other aromatics,  $C_9$ 's and  $C_{10}$ 's can be found in several places in the refinery. Humble's H. W. Earhart and colleagues\* at the recent Petroleum Congress (*CW*, June 13, p. 108) gave figures on the quantities produced in the reformer of a typical Gulf Coast refinery. They also showed equivalently large amounts in virgin naphthas and the product from a catalytic cracker. But the aromatics from cat crackers are not extracted to any extent at the moment because a high olefin content complicates separation. At least for the present, interest in the polymethylbenzenes centers around those contained in the reformat.

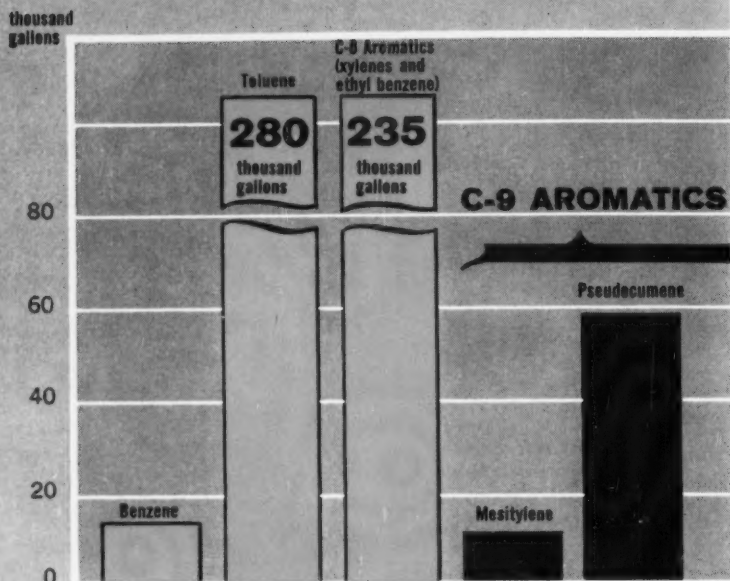
Both the  $C_9$  and  $C_{10}$  streams currently are used as solvents. They're valued for their good solvency combined with slow evaporation, find applications in forced-dry enamels. For example, the  $C_9$  stream is used in such things as wire enamel and insecticide formulations. The  $C_{10}$  stream has a higher flash point (150 F vs. 100 F) and is employed as solvent for automotive enamels.

Humble, along with Indiana Standard and Eastern States, is an important factor in both types (Solvesso 100 and Solvesso 150). After Hydroforming to a desired end-point, it distills out the higher aromatics. Alternately, it could use the  $SO_2$  wash oil process to pull all the aromatics out of the reformat. Sinclair, which uses Udex to extract aromatics, distills out  $C_9$ 's, which it sells as Sinclair 110. It does not now have a  $C_{10}$  solvent but soon will. Shell employs its own extractive distillation process to produce a  $C_9$  solvent (Cyclo-Sol 53). It also sells a 75% aromatic solvent containing  $C_{10}$ 's along with a number of others—TS-28R. This is a naphtha extract.

But although there are a number of producers, the market for such solvents is somewhat limited right now. The biggest single user is the automo-

\* R. L. Heinrich, E. W. Lewis, T. M. Newson, E. F. Wadley

## New Raw Material For



Yearly production from 1,000 bbls./day of crude oil, in a typical

tive industry. Each of the country's 5.5-6 million new cars annually uses 6.5-8 gal. of paint. The auto maker uses up to 15%  $C_{10}$  aromatic solvent in each gallon; paint formulators use an equivalent amount of  $C_9$ 's or  $C_{10}$ 's in their formulations. That comes to a market of about 15 million gal./year. Adding in other uses, the total market is between 25 and 35 million gal./year. Since they sell for approximately 30¢/gal., that means a total business of \$11 million tops.

### THE $C_{10}$ COMPOUNDS

What the refiners would like to do is to collect the premium for a chemical raw material by pulling some pure compounds out of reformat, since one good-size plant producing a pure compound could almost equal the total solvent business.

There are nine  $C_9$  and 27  $C_{10}$  isomers that are found in measurable quantities in the reformat. But the most promising, from the standpoint of ease of extraction, abundance and functionality, are the three trimethylbenzenes—pseudocumene, mesitylene and hemimellitene—and the two tetramethylbenzenes, durene and isodurene.

**Durene:** And right now, durene gives evidence of being the first one to go commercial. Because of its high

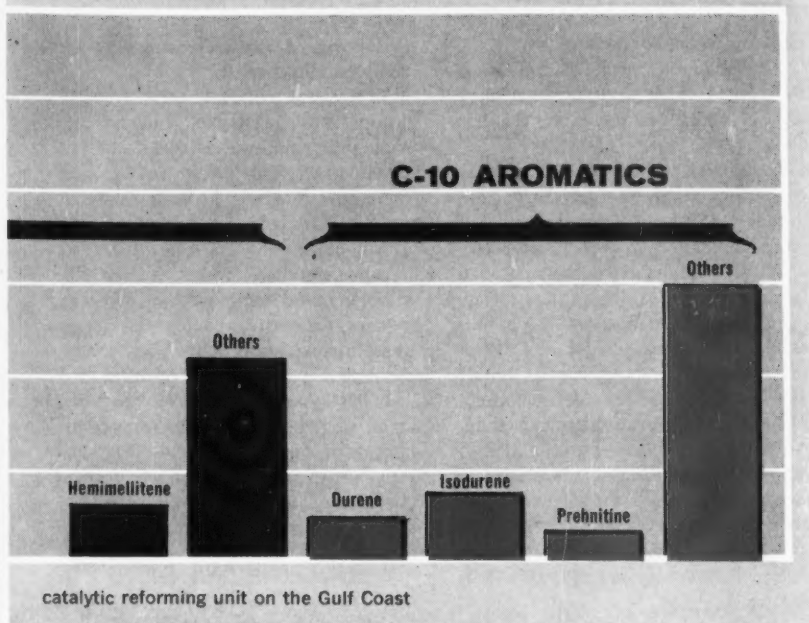
freezing point (175 F), it can be removed from the stream by fractional crystallization. Basically, the technique is similar to that employed for extracting *p*-xylene. However, Sinclair's C. J. Francisco, research vice-president, warns that the "crystal habit of durene is different from that of *p*-xylene, so a process adaptation involves more than a mere change in temperature."

Humble, Shell and Sinclair are all supplying the compound in drum lots or larger. Humble is selling it for \$1.50/lb. for drums in less than car-load lots. Shell's price ranges from \$1.15 to \$1.50/lb. depending on quantity. Sinclair has two prices—\$1.60/lb. for 60-lb. drums, \$1.50/lb. in 55-gal. drums. But all agree that on a sufficiently large scale, it could be made to sell profitably for 25¢/lb.

That would mean a 20-25-million-lbs./year plant. Ironically enough, although durene makes up 8% of the  $C_{10}$  aromatics in the reformat, production of that size would call for synthetic durene. For example, Sinclair at its Marcus Hook refinery has durene available at a 10-million-lbs./year rate. Even that is misleading because, during the heating season, fuels cut into the heavy ends of the gasoline, so that Sinclair could produce only 5 million lbs. of reformat durene.

Fortunately, synthesis of durene poses no unusual problems. It could

## A Petrochemical Boom?



be made from benzene, toluene or xylenes. However, pseudocumene appears to be more attractive. It is abundantly available in the  $C_9$  stream, easily removed and requires only one mole of alkylating agent.

Several syntheses for durene have been worked up. Shell's vapor-phase method (U.S. Patent 2,756,261) uses methanol to methylate pseudocumene or other feed. The product is fractionated to pull out the  $C_{10}$ 's, from which durene is crystallized. Over- and underalkylated material (from the fractionation step) are sent to a second reactor, where they're trans-methylated to produce more durene. Isomers (the filtrate from the crystallizer) are sent to the same reactor, where they're isomerized into durene.

Humble has a liquid-phase version employing methyl chloride as the methylating agent, aluminum chloride as the catalyst. The reaction is carried out at atmospheric pressure, converts about 90% of the methyl chloride without degradation to side products. All recycle streams are returned to the original reactor for transmethylation and isomerization.

The process, as Humble sees it, has several points to recommend it: only one reactor is needed; aluminum chloride make-up is small; and the process is flexible enough to be used for other methylbenzenes. By omitting

the methyl chloride, for instance, it could be used to isomerize pseudocumene to mesitylene. By using more methyl chloride, it could produce penta- and hexamethylbenzene. Or, since the catalyst also promotes disproportionation, it could be used to make xylenes, or xylenes and durene.

Sinclair is also working on an alkylating process which it describes as being moderately high-temperature and a hybrid liquid- and vapor-phase. Its main objective is to seek out a more efficient catalyst.

Indiana has patented a process (U.S. 2,589,621; 2,803,681) suitable for making mesitylene and durene. It employs hydrogen fluoride, or hydrogen fluoride-boron trifluoride, as catalyst. A feature of the latter approach is that it's possible to get a degree of control over the production of isomers by altering the ratio of hydrogen fluoride to boron trifluoride. In other alkylation processes, the isomers are produced in thermodynamic equilibrium concentrations. But by using high concentrations of boron trifluoride, for instance, the process can be directed to one isomer only.

Another way of eliminating the production of unwanted isomers has been investigated by members of the Shell group and California Standard. In this method, two moles of pseudocumene, say, are condensed with for-

maldehyde in the presence of a catalyst to form a di-(trimethylphenyl)-methane and a molecule of water. This is split by heat in the presence of hydrogen (hydrocracked) to form a mole of pseudocumene (the feed) and one mole of durene. The process can be used for synthesizing *p*-xylene, pseudocumene and durene.

If the starting material is toluene, 75% of the product is *p*-xylene; if it's *m*-xylene, 90% is pseudocumene; if it's pseudocumene, 91.5% is durene.

**What It Can Do:** The most promising durene derivative at the moment is pyromellitic acid (PMA) and its dianhydride (PMDA). Du Pont is selling it in developmental quantities for \$3/lb. The price for the product from its larger unit has not been settled upon, but it will be in the range of \$1/lb.

Du Pont won't say how it is making the product, won't even admit that it starts with durene. But the conviction in the trade is that it is using Sinclair-supplied durene.

The difficulty in making a polycarboxylic acid from a polymethylbenzene is that one methyl group reacts easily enough but the others resist oxidation. Both Esso and Cal Research have developed vapor-phase air oxidations to make PMDA; neither, however, has been commercialized. Amoco reports it can make the product by its liquid-phase catalytic air oxidation (*CW*, April 7, '57, p. 32). In its literature on durene, Shell suggests that the most attractive route may be an air oxidation followed by a second oxidation using nitric acid.

However Du Pont does it, PMDA is now finding gainful employment as a curing agent for epoxy resins. It's being recommended primarily to impart high temperature resistance to the finished resin. This application is covered by a Ciba patent (U.S. 2,324,483). But it's likely that Ciba and Du Pont will come to an agreement on it.

One difficulty in using PMDA is that it has a high melting point (286°C) and limited solubility in common organic solvents. Du Pont has devoted considerable effort to finding easier methods of handling it. One result is a series of PMDA-glycol adducts that are liquid but suitable for use as cross-linking agents. Another: a finely dispersed PMDA that accomplishes

essentially the same purpose.

PMDA can also be used to cross-link epoxy plasticizers (e. g., epoxidized soybean oil) in fluid plastisols to produce fused products that are tough and rigid. Metal salts are also being evaluated. These are made by converting the acid to the sodium salt, then adding it to an aqueous solution of a metallic chloride, nitrate, sulfate or carbonate. Chromium, cobalt, copper and other salts are being considered as stabilizers and pigments for baked alkyd enamels. Esters of PMA show promise as specialty plasticizers and synthetic lubricants.

Another possibility for PMA or PMDA is the formation of linear polyesters. If reacted with ethylene glycol, say, at sufficiently low temperatures, only two carboxylic groups react in forming a linear polyester. This can be later modified by reacting the other two carboxylic groups on each ring of the polymers.

Although PMA and PMDA are winning the most notices right now, there's a whole literature on other reactions for durene. In fact, it can do more things than a pair of pliers.

Shell has had nine derivatives of durene available in research quantities. It has done work indicating it can be nitrated, sulfonated, chlorinated and chloromethylated almost as readily as phenol. Humble has two derivatives available. In addition, it has done work on making fibers. On that score, it says only that it is not extensively engaged in fiber research as such, but that durene, because of its molecular symmetry, lends itself to use in fiber chemistry.

The work by 3M's Errede and Syracuse's Szwarc shows that *p*-xylene, durene, pseudocumene and isodurene pyrolyze, then polymerize to form linear polymers, probably of high molecular weight.

In the pyrolysis, the methyl groups ortho and para to each other become unsaturated—forming substituted xylenes (or *p*-xylene from *p*-xylene). Attempts to polymerize *p*-xylene with conventional monomers were unsuccessful. But it could be polymerized with molecules of the same class such as pseudocumene. This could be done either by pyrolyzing a mixture of the two or by pyrolyzing them separately, mixing the gaseous prod-

ucts and then condensing them.\*

The polymeric products are potentially of interest as fibers or films. 3M, of course, is more interested in films.

**Isodurene:** Making up 12.7% of the C<sub>10</sub> aromatics in the reformat, isodurene (1,2,3,5-tetramethylbenzene) is more abundant than durene, but somewhat more difficult to extract. It is found in large quantities in the filtrate from durene crystallization. But it boils at 388 F—so close to durene's 385 F that product purity of approximately 90% is about the feasible maximum. Like durene, it can be synthesized. And it undergoes reactions similar to durene. But the feeling is that, even in large quantities, it would be considerably more expensive than durene. And that, plus its lack of symmetry, has caused it to corner less attention than durene.

### THE C-9's

Just as durene is the most promising C<sub>10</sub>, pseudocumene is the most promising C<sub>9</sub>. It makes up a healthy slug (41.3%) of the aromatic C<sub>9</sub>'s in the reformat. Moreover, its boiling point of 337 F is sufficiently different from its nearest boiling isomers (mesitylene and *o*-ethyltoluene at 329 F and indane at 352 F) that it can be produced in good purity by conventional distillation; 100 plates turn out a 95% product.

This means that pseudocumene made on a large scale should be relatively cheap. Enjay estimates that in large enough volume it could sell for a price "in the low 'teens." Sinclair is prepared to sell two grades, one containing 88% pseudocumene, the other, 95%. Since the impurities would be largely paraffins, it feels that many applications could take the lower-grade material. And it feels it could sell such a grade at 12¢/lb. of contained pseudocumene. The higher-purity material would go for about 15¢/lb.

Besides its potential as a feed stock for durene or mesitylene, pseudocumene is the starting point for a number of potentially significant products. Humble researchers gave a paper at the Gordon Conferences in 1958 citing the use of dimethylcarboxylic

derivatives of pseudocumene as modifiers for alkyd resins.

Conversion of all three methyl groups into carboxylic groups yields trimellitic acid, which can be dehydrated to the anhydride (TMA). And right now, TMA is to pseudocumene what TMDA is to durene.

Amoco is now making TMA in developmental quantities. It uses the same technique employed in oxidizing xylenes to phthalic acids—a liquid-phase air oxidation in the presence of an oxidation catalyst and bromine.

It has looked into TMA extensively as an ingredient for alkyd resins, has concluded that it may prove particularly useful in making alkyd surface coatings of the water-soluble baking type. It also increases hardness, speeds drying for air-drying alkyd resins.

With epoxides, TMA can form a new type of epoxy polymer. This is done by alternately reacting the carboxyl group with the epoxide and then the anhydride grouping with the hydroxyl group formed from the first reaction. By altering the reaction conditions and the quantity of material charged, the molecular weight of the resin and the ratio of hydroxyl to carboxyl groups can be varied.

Amoco has prepared resins from oxides of ethylene, propylene and styrene, from epichlorohydrin, glycidial methacrylates, epoxies and others. It feels that the use of propylene oxide is particularly significant because it's cheap and the products can be processed at atmospheric pressure.

Esters of TMA are suggested as plasticizers. Also, TMA can be used to make new or modified polyesters; adhesives (a resin made from TMA and glycerine is now being evaluated for bonding aluminum); and in dyes and pigments.

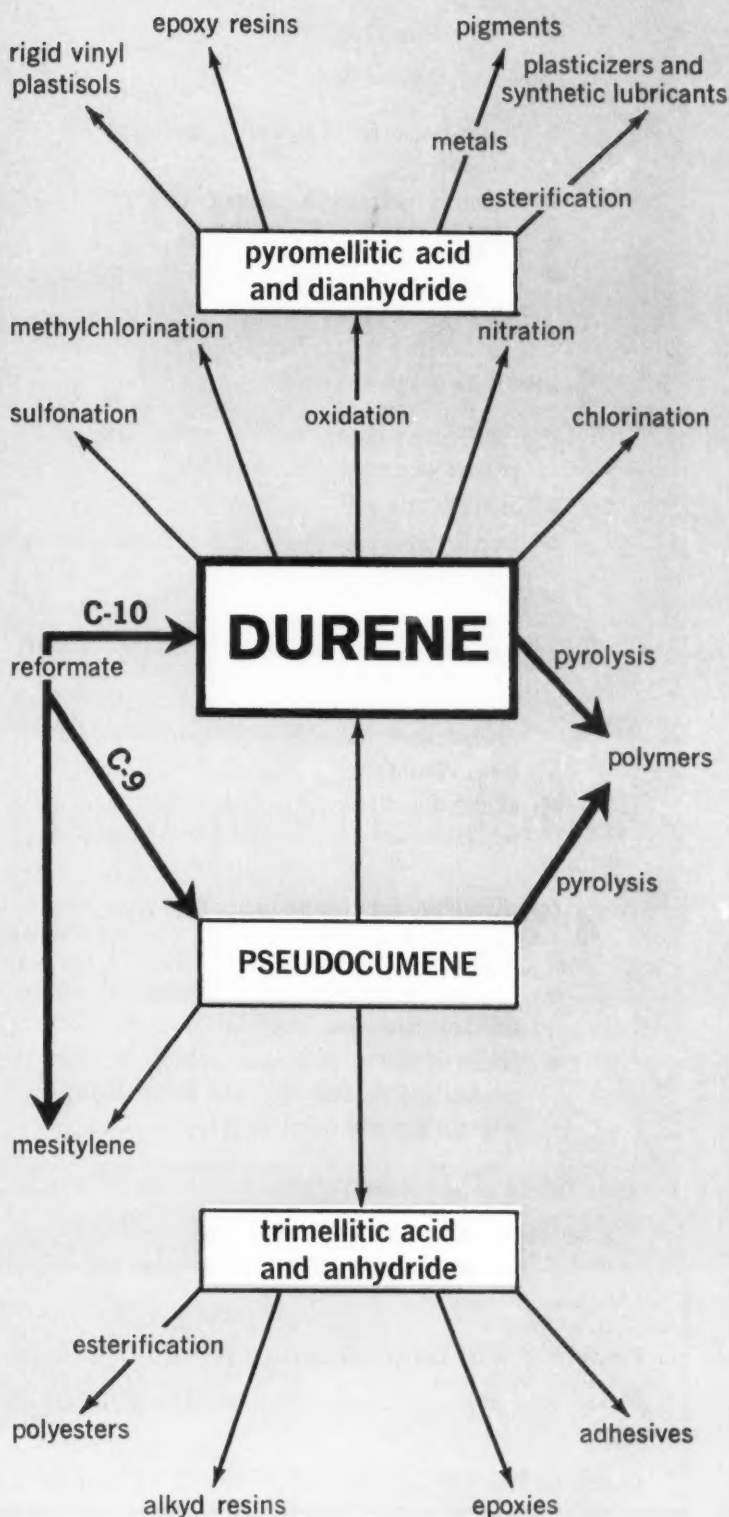
**Mesitylene, Hemimellitene:** Mesitylene makes up 7.6% of the C<sub>9</sub> aromatics. Its boiling point is the same as that for *o*-ethyltoluene, which also is produced in large quantities from reforming. However, its freezing point is -49 F (vs. -114 for *o*-ethyltoluene).

Consequently, it can be pulled out by a combination of distillation and crystallization. The alkylation methods for synthesizing durene from pseudocumene can be adapted to isomerizing pseudocumene to mesitylene. There's

\* This work is reported in *Quarterly Reviews*, Dec. '58.

## Why Durene Shows Promise

The reactions of durene (right) add up to one good reason why the chemical seems to have a promising future. It can be sulfonated, nitrated, chlorinated and chloromethylated almost as readily as phenol. Oxidation of all three methyl groups to carboxyls produces PMA and PMDA, which are already finding specialty markets. The reactions also show why pseudocumene is gaining importance. It's an attractive feedstock for synthesis of either durene or mesitylene. And it's used to make TMA, which, like PMA and PMDA, is showing signs of growth — as an ingredient for alkyd resins, epoxies and a number of other applications.



## Four Ways To Make Durene

### 1 Vapor-phase alkylation (Shell)

- Pseudocumene (or other feed) is methylated with methanol
- Product is fractionated to remove  $C_{10}$ 's
- Durene is crystallized from  $C_{10}$ 's
- Recycle streams are sent to a second reactor for transmethylation, isomerization

### 2 Liquid-phase alkylation (Humble)

- Pseudocumene is methylated with methyl chloride in presence of aluminum chloride catalyst
- Separation is essentially same as above
- Recycle streams are returned to original reactor for transmethylation, isomerization

### 3 Hydrogen fluoride-boron trifluoride catalysis (Indiana Standard)

- Methylation is carried out in presence of hydrogen fluoride alone or a mixture of hydrogen fluoride and boron trifluoride
- Altering ratio of boron trifluoride to hydrogen fluoride permits direction of product toward desired isomer

### 4 Condensation followed by hydrocracking (Shell group, California Standard)

- Pseudocumene (or other feed) is condensed with formaldehyde in presence of catalyst
- Product is split in presence of hydrogen to form pseudocumene (or other feed) and durene (original feed, plus additional methyl group)

a strong possibility that mesitylene could be made to sell on a large scale for 25¢/lb.—the projected price for durene under similar conditions.

The three methyl groups of mesitylene can be oxidized to form trimesic acid. (Amoco's process, for one, can do it.) Derivatives have been evaluated for such applications as surface coatings. Humble has made samples of trichloromethylmesitylene. (In general, chloromethylated aromatics are quite reactive, undergo oxidation, reduction, hydrolysis and other reactions readily.)

Hemimellitene (1,2,3-trimethylbenzene) makes up 8.2% of the  $C_9$  aromatics. Like mesitylene, it can be extracted by a combination of distillation and crystallization. Purifications up to 95% are considered practical. But the consensus of refiners is that, even on a large scale, hemimellitene would be considerably more expensive to produce than either durene or mesitylene.

**What's Needed:** Refiners have not built commercial facilities for making any of the polymethylbenzenes because there's no established market for them. Chemical companies, on the other hand, have shied away from investigating them because there are no commercial plants to supply them.

The clear need, then, is for a derivative to establish a chemical market and justify for the refiner the building of a commercial unit.

Even the cheapest of them—pseudocumene at 12-15¢/lb.—would require a specialty market to become established—in fibers or films, or to lend special properties to alkyds or epoxies. But, as soon as one of them becomes established as a chemical raw material, refiners would have an incentive to seek out simpler, cheaper means of extraction or synthesis.

In any case, the chemical industry may be missing a bet by overlooking functional, abundant raw materials for which there is no lack of potential suppliers.

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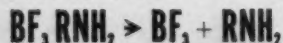
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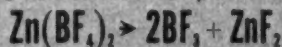
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# SPECIALTIES



Smithsonian curators keep the past bright with the help of . . .

## History-Saving Specialties

This week another 100,000 sightseers will wander through Washington's famed Smithsonian Institution. They'll gaze at the huge African elephant in the middle of the Natural History Building, at Grace Coolidge's red-velvet flapper dress in the First Ladies Hall, and at ancient bronze vases in the Freer Gallery.

However large the Smithsonian seems to the museum-goer, it seems even larger to its 85 curators, whose job it is to maintain over 51 million different specimens. (Only 5% of these are on public display; the other 95% make up the Smithsonian's study collections.)

**500 Years from Now:** The curator is concerned with preserving objects for centuries—not for just a few decades. This naturally makes it hard to sell him any new chemical maintenance products. If a currently used product works well, he usually sticks with it for a good many years; but if a preservative treatment isn't doing the job, he seeks new materials. In such instances, the Smithsonian's cu-

rators may order chemical specialties that haven't yet reached the market.

**Cleaning Up the Past:** For the most part, techniques and products used to preserve the Smithsonian's objects don't differ widely from those used by the housewife.

But Vladimir Clain-Stefanelli, numismatics curator, told *CW*, "It's easy to do too much. . . . We have to think many times whether we should treat a coin at all. The simplest way is always the best." Stefanelli's preservation philosophy is shared by all the curators. Here, for example, are a few specific examples of how the museum cares for its specimens:

**Coins:** A solution of warm water and mild soap is normally used to clean coins. Severely corroded silver and copper coins are frequently cleaned electrolytically, gold coins with a solution of potassium permanganate and sulfuric acid, bronze coins with chloroform/alcohol or xylene. To preserve the finish, most coins are sprayed with an acrylic lacquer, others are simply coated with a neu-

tral oil. This year, Stefanelli plans to treat 400 bronze medals, 5,000 silver coins and a smaller number of gold coins. The big problem is sulfur contamination. Storage trays must be kept free of sulfur-containing paper, paint, glue or rubber bands.

**Costumes:** The National Institute of Drycleaning (Silver Spring, Md.) has charge of drycleaning most of the costumes. Costumes from before 1900 are never cleaned, however. Garments that require laundering are rocked back and forth in glass jars containing a mild soap solution, and bleach if necessary.

Insecticides and mothproofers are replaced twice yearly in the storage collections, almost daily in the exhibit collections. One interesting sidelight: all gowns in the First Ladies Hall, as well as the uniforms of George Washington and Thomas Jefferson, contain hidden bags of naphthalene.

**Military History:** Regular gun solvents and oils are used to clean the Smithsonian's firearms. Edgar Howell, acting curator of military history, told *CW* that firearms are handled only with white gloves, since moisture on one's hands encourages rust. No chemicals are used to clean the original Star-Spangled Banner; it's simply vacuumed through a very fine plastic screen.

**Freer Gallery:** The Freer Gallery of Art, which contains American and Eastern art (Japan, China, Iran, Korea and the Near East), employs its own Japanese restoration artist, T. Sugiura. Practically all of the paints, pigments, papers and silks he uses in restoring screens, paintings and other Eastern objects are imported from Japan.

A few of the more commonly used methods of restoring and preserving Eastern paintings include: oxalic acid and potassium permanganate for bleaching badly soiled papers; wheat paste containing eugenol as a fungicide for pasting silks to screens; a mixture of alum and glue for brightening the colors in paintings.

Ancient bronze and silver objects are simply washed in soap and water, polished with a commercial silver polish, and lacquered. A Bodhisattva sculpture from the Fujiwara period (10th century) was a special problem: the golden sculpture has been in a

## SPECIALTIES

temple for centuries, had turned completely black from incense smoke. After testing many different cleaning materials, a dilute solution of a light-duty detergent applied with cotton swabs was found to do the trick.

**Black Horse:** Then there's the case of General Sherman's horse, which had faded from black to red-brown. Solution: using an animal dye, the entire horse was dyed black.

Chemical specialties are also used in exhibits. Hair dyes are used to make stripes on animals; plastics are used to construct foliage for many of the exhibit cases. The collection of Dutch pottery, which isn't enclosed in cases, is cemented down with an epoxy resin. This material was also used in mounting the hide of the record-size elephant in the Natural History Building.

The most dramatic exhibit now being prepared is an 8,000-lb., 97-ft.-long blue whale, to be built of polyester resin and fiber glass.

**Chemicals Bought:** Here are some of the major materials the Smithsonian buys:

- Alcohol: 3,300 gal./year. Over 90% of the museum's 1.7 million fish, 147,000 reptiles and 1.6 million marine invertebrates are stored in air-tight jars containing alcohol.

- Formaldehyde: 100 one-pound bottles/year. Tissues of many of the zoological specimens stored in alcohol are first impregnated with formaldehyde. Most of the formaldehyde is used for fish collections.

- Hydrochloric acid: 650 gal./year. The department of invertebrate paleontology and paleobotany processes three tons of rock each year in order to release fossils from their matrix. Hydrochloric acid is used on those fossils, which are embedded in calcium carbonate and have pores filled with silica. Other chemicals used to expose fossils include: hydrofluoric acid (used on fossils embedded in silica with calcium carbonate-filled pores); gasoline, hydrogen peroxide and oxalic acid (used to disintegrate shale). Altogether, the Smithsonian's fossil collection totals 12.1 million specimens.

- Naphthalene: 2,500 lbs./year. Over 90% of the massive insect collection (13.6 million specimens) is kept in 30,000 storage drawers. These storage drawers all contain naphthalene. Naphthalene crystals are also

used to protect the textile collections.

Other chemical specialties the Smithsonian buys in substantial quantities include gaseous fumigants (a mixture of carbon tetrachloride and ethylene dichloride is the most popular), animal hair dyes, cleaners and polishers, photographic supplies, electroplating chemicals, acrylic lacquers, epoxy resins, pastes and glues, lubricating oils and greases, soaps and detergents, mothproofers and leather preservatives.

**How They Buy:** Since the 10 bureaus\* of the Smithsonian Institution are supported in whole or in part by federal funds, practically all the chemicals used for preservation are purchased through government channels. This procedure gives the Smithsonian the advantage of large-volume buying. In purchasing these specialties, usual federal buying procedures are followed. Small purchases, usually less than \$25, are occasionally made outside the federal setup.

Curators probably have the strongest buying voice (they frequently specify brandnames), and the officials of the supply division are a secondary influence.

Curators' requests for chemical materials are usually made on a quarterly basis, since the Smithsonian is budgeted quarterly. However, there's no specific rule. Materials are frequently ordered as they're needed.

Materials most commonly used are stored at the museum. A year's supply is the usual inventory.

**Growing Market:** Although the Smithsonian will always be a small and specialized customer of chemical specialties, it does show signs of becoming a more important customer. The \$36-million Museum of History and Technology, now being built along the Mall, is certain to increase the Smithsonian's chemical specialties shopping list. Construction plans for the new 13-million-cu. ft. building, scheduled for completion in '61, call for a larger and more complete analytical lab. Also in the works: two new wings for the Natural History Building. And as the Smithsonian grows, so will its need for chemical specialties.

\* The 10 government bureaus that function under Smithsonian direction include: the U.S. National Museum; the Bureau of American Ethnology; the Astrophysical Observatory; the National Collection of Fine Arts; the Freer Gallery of Art; the National Air Museum; the National Zoological Park; the Canal Zone Biological Area; the International Exchange Service and the National Gallery of Art.

## PATENTS

Recently issued U.S. patents of interest to chemical specialties makers and sellers include:

- U.S. 2,889,298, assigned to the United States, describes a liquid anti-fogging composition made up (parts by weight) of water and ethanol (46 parts each) polyvinyl alcohol (5 parts) glycerine (2-2.5 parts), lithium chloride (0.2-0.3 parts) and sodium tall-oil methyl tauride (0.1 to .2 parts).

- U.S. 2,890,184, assigned to Reichhold Chemicals, describes mixtures of epoxy resin- and polyamide-like condensations, which, when heated and treated with an aliphatic polyamine, produce compositions suitable for plastic materials, lacquers, adhesives, etc.

- U.S. 2,890,187, assigned to Esso Research and Engineering Co., describes curing of a polyolefin in a manner analogous to rubber. Polypropylene (intrinsic viscosity of 0.2 to 6) is treated with an alkyl aluminum-titanium halide catalyst and cured through use of either of two curing mixtures, both of which contain sulfur or sulfur-containing compounds, zinc oxide, and stearic acid.

- U.S. 2,890,927, assigned to Ruhrchemie Aktiengesellschaft (Germany), describes rubber-like properties obtainable from paraffin (20 or more carbon atoms) when it is first chlorinated, then dehydrochlorinated by heating at 250-320 C for several hours.

## PRODUCTS

**Thermosetting Acrylic Resins:** Rohm & Haas (Philadelphia) has gone into production of two thermosetting acrylic polymeric resins for coatings. The products, baking enamel components, are a solution polymer, Acryloid AT-50, and an emulsion polymer, Rhoplex AC-200. Both are suggested for formulation into metal coatings and finishes.

- **Polyurethane Mold Release:** Shanco Plastics and Chemicals (Tonawanda, N.Y.) has developed a material (Shanco 32-6 mold release fluid), which acts as a release agent for polyurethane foams molded in glass-fiber polyester molds.

- **Epoxy Enamel Stripper:** Enthone

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## EXHIBIT A

ONE SPARKLING CLEAN BOTTLE  
—The inclusion of Pfizer Gluconates in your formula will assure bottling customers of a compound which will give spotless results. Pfizer Gluconates have proven to be the product of choice for preventing formation of film on bottles and scale on equipment.

## EXHIBIT B

ONE BRIGHT STRIP OF ALUMINUM  
—Pfizer Gluconates in your aluminum etching compounds prevent the formation of hard, adherent scale. Both Sodium Gluconate and Gluconic Acid increase caustic efficiency—you use less in your compounds yet assure your customers of a more uniform etch.

## EXHIBIT C

ONE DE-RUSTED BOLT—Superior caustic rust removal compounds are now possible through the inclusion of Pfizer Gluconic Acid or Sodium Gluconate. In caustic solutions Pfizer Gluconates dissolve rust and prevent after-rust while increasing the efficiency and prolonging the life of the bath.

## EXHIBIT D

ONE SHINY PIECE OF STEEL—Pfizer Sodium Gluconate and Gluconic Acid improve the effectiveness of your caustic paint stripping compounds by eliminating the usual brown layer of iron hydroxide. Also they permit freer rinsing of the paint-stripped metal.

# THE VERDICT

The verdict is unanimous—Pfizer Gluconic Acid and Sodium Gluconate assure you of compounds with the highest cleaning and etching efficiency. Write Pfizer for complete technical data and information on the proper Gluconate use levels.

CHAS. PFIZER & CO., INC., Chemical Sales Division, 630 Flushing Ave., Brooklyn 6, N. Y. Branch Offices: Clifton, N. J.; Chicago, Ill.; San Francisco, Calif.; Vernon, Calif.; Atlanta, Ga.; Dallas, Tex.

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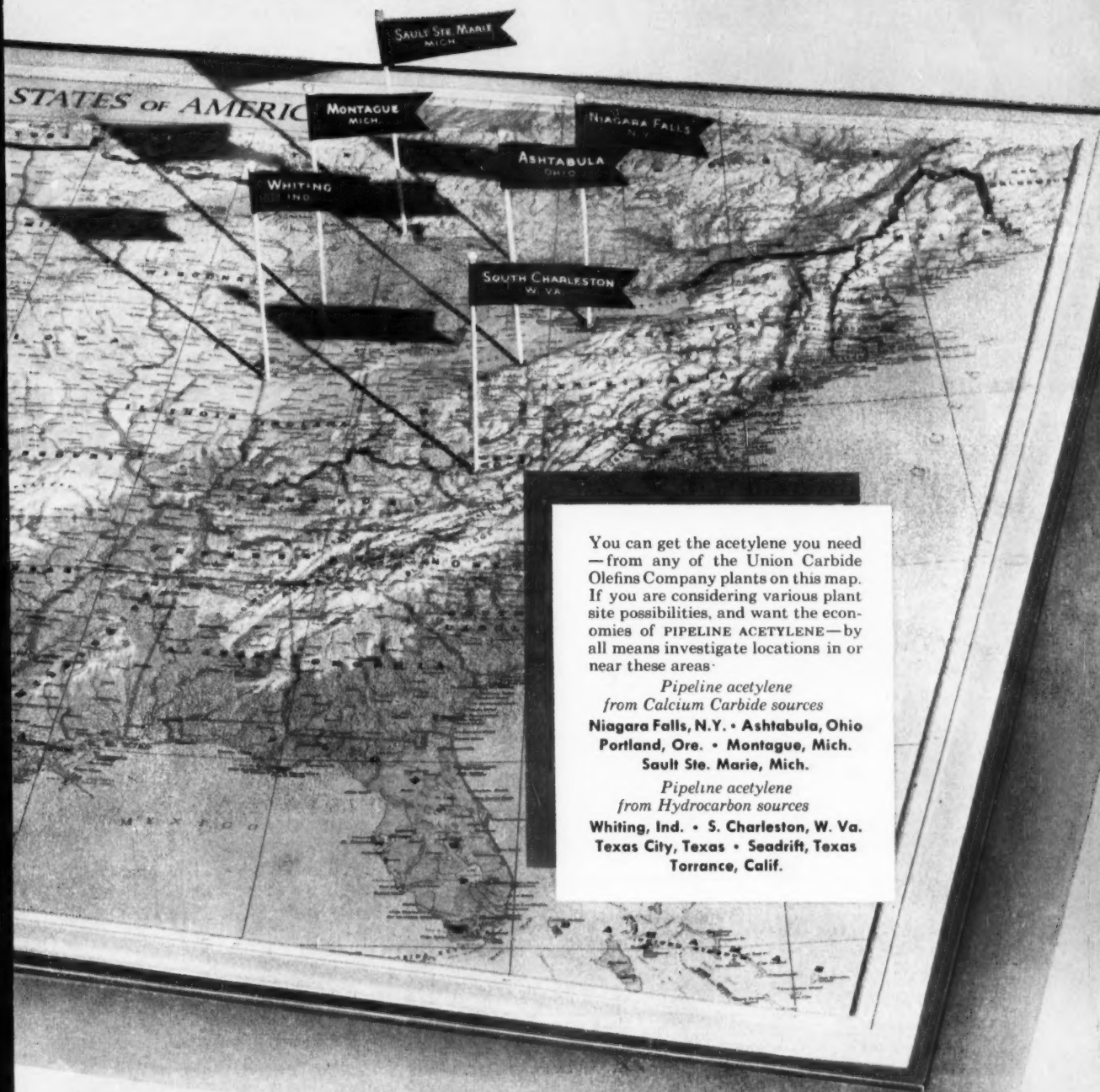
**YOUR PLANT**, located near one of these sources of pipeline acetylene, gains numerous advantages—convenient electric power... plenty of cooling water... transportation by rail, water and highway. Other raw materials are available close by... and profitable markets for chemical products already exist in many of the areas.

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**Union Carbide Olefins Company** also supplies engineering and planning assistance in the selection of generators, special trucks and other equipment for utilization of carbide in bulk. Extensive studies of freight rate differentials affecting calcium carbide shipments can be supplied on request.

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**SPECIALTIES**

Inc. (New Haven, Conn.) has developed a cold, chlorinated liquid stripper for epoxy enamels. It's called Stripper S-26, can be diluted with up to 20 parts by volume of water.

**Tire Cracking Inhibitor:** Naugatuck Chemical Division of U.S. Rubber has developed a material, Flexzone 3-C, which acts as an antiozonant-antioxidant, inhibits cracking of tire side-walls and treads.

**Polyolefin Wax:** Philip H. Rhodes and Associates (2861 Sidney Ave., Cincinnati) is offering a vaseline-like, polyolefin wax (molecular weight range: 3,500-4,000), with initial melting point at around 80 F. It's proposed as a lubricant in mechanical processing of plastics and rubber and as a mold release agent.

**Label Printer:** A flexographic printing press capable of printing 6,000 labels/hour (3x4-in. maximum) has been developed by Shohn Mfg. (P.O. Box 87, Plymouth, Wis.). It prints and die-cuts on pressure-sensitive label paper or score-cuts on gum, heat-seal or plain paper. It measures 9x9x9 in., weighs 40 lbs., is priced at \$395.

**Rail Joint Adhesive:** An adhesive for bonding railroad rails to rail joints (where free play can cause wearing) has been developed by Armstrong Cork Co. (Lancaster, Pa.). The adhesive, called Bondarc, is spread on the bearing surfaces of the joint bars by hand, sets in two and one-half to four hours.

**Low-Odor Plasticizers:** Monsanto Chemical Co. (St. Louis) is offering two plasticizers, diethyl phthalate and Santicizer B-16, in forms with low odor characteristics. There will be no price increase for the new materials, Monsanto says.

**Metallizing Lacquers:** Schwartz Chemical Co. (50-01 Second St., Long Island City, N.Y.) has developed lacquers for application before and after deposition of aluminum in vacuum metallizing of polystyrene. The base coat is designated BC-107; the top coat, TC 101. Both can be applied by spraying, dipping or flow-coating. They're supplied in 5- and 55-gal. containers.



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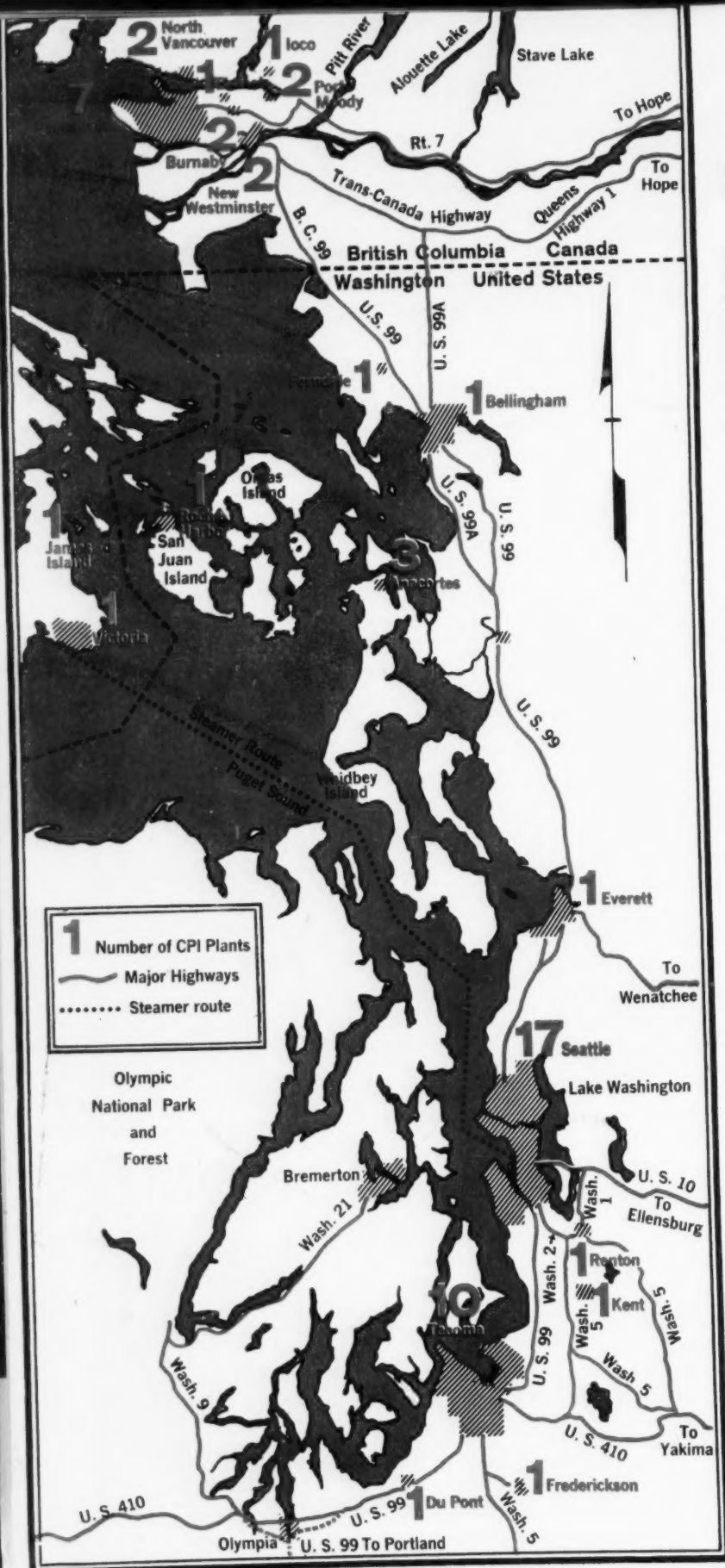
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## Sparking a New

Lumber, of course, continues to be one of the major natural resources for chemical and other industries along with water and electric power. This was illustrated last week by Georgia-Pacific Co.'s plans to build a pilot plant for production of a family of chemicals from bark and wood wastes. Now, G-P's project looks set for Oregon, but abundant raw materials, power and water are available all along the vast reaches of Puget Sound and on to Vancouver, B.C.

**Trend to Tacoma:** Tacoma is one PNW area where growing chemical industries have had a stimulating effect on a somewhat lagging economy. Under way for the past decade, the trend to build at Tacoma has made the city a queen on the international waterway that forms Puget Sound and the famed inland waterway to Alaska.

Tacoma's economic problems began shortly after World War II, when area lumber mills were forced to move northward closer to their supplies of logs. As a result, Tacoma became an exporter of labor, mostly to Boeing Airplane Co.'s plants in up-Sound Seattle. Then came the trend to chemicals. The very forest-products industry that left Tacoma became a heavy consumer of chemicals for plywood, pulp, paper and other products. Chemical plants in the Tacoma area expanded to supply the demand.

Assuredly, Seattle will retain its status as the metropolis of the PNW, but the shift of U.S. military emphasis from aircraft to missile production is reducing Boeing's employment (since the first of the year, the firm's employment has dropped about 6,500 to 66,000). This factor, which has made more skilled labor available for other industries, plus the trend to chemicals, is serving to win for Tacoma the position of No. 1 chemical

## Growth for Pacific Northwest

center of the Pacific Northwest area.

**Petrochemical Development:** Petrochemical development in the Pacific Northwest looks promising; petroleum sources shortly will be better than adequate. Already, there are four major petroleum refineries—representing a total investment of \$145 million—in operation in the area from Tacoma north to the Canadian border, and three more are expected by '65.

These seven will have an installed capacity of approximately 300,000 bbls./day, sufficient to provide residuals to support profitable production of many petrochemicals. Should Alaskan oil fields develop as hoped, the crude could be processed in refineries on Puget Sound, thereby increasing the supply of available chemical blocks. Additional residuals would be available from refineries in British Columbia.

First developments in petrochemicals probably will be in anhydrous ammonia, pesticides and insecticides, all of which can be marketed in western Washington. Hooker is the only firm in the area now turning out ammonia, producing at the rate of 60 tons daily.

In the meantime, a new petrochemical by-product operation, based on waste products from Puget Sound refineries, is being launched. Northwest Petrochemical Corp. (Vancouver, Wash.) plans to build a phenol-cresol recovery plant at Anacortes, Wash., adjacent to Texaco and Shell refineries. The new plant will obtain waste caustic sludge—by pipeline from the adjacent refineries of Texaco and Shell, by truck from General Petroleum refinery at Ferndale—and will also obtain material from the four refineries in British Columbia. Cresylic acid will be recovered, refined into phenols and cresols (ortho-, meta- and para-) for sale to the adhesives industry.

Further development in petrochemicals will have to await further population growth. Washington now has a population of about 2.75 million; it is expected to increase to 3.5 million by '70.

**Future for Silvichemicals:** Silvi-

chemicals also offer attractive possibilities for the future, although development of petrochemicals probably will come first.

Weyerhaeuser Timber Co., headquartered in Tacoma, expects to decide this month if it should proceed further in the chemical industry, probably by first producing such bark derivatives as quercetin and waxes.

Research holds promise of building an entire silvichemicals industry based on wood carbohydrates, just as the petrochemical industry is based on the hydrocarbons in gas and oil.

**Reichhold Expansion:** The trend to chemicals at Tacoma was emphasized further this year when Reichhold Chemicals, Inc., began expanding its Tacoma plant. Construction of a \$500,000 unit slated to produce water-soluble resins and emulsions is in progress, and engineering is under way for another resins unit. The latter unit, on which work is expected to start after September, will produce polyester resins and alkyd resins, for the first time in the Pacific Northwest.

Reichhold also talks of building a \$4.5-million, 30-million-lbs./year phenol plant. It would be important not only as a supplier of raw material to local industries but also as a consumer of chemicals, viz., sulfuric acid, caustic soda, benzene. Reichhold Chemicals of Canada, Ltd., is currently making engineering studies on a 15-million-lbs./year phenol plant for its Port Moody, B.C., site about 160 miles north of Tacoma.

Reichhold is bullish on Tacoma's over-all chemical growth potential. "There's no question in my mind," declares E. M. Skytta, RCI's vice-president of its PNW division, "that Tacoma will become increasingly the chemical center of the Pacific Northwest."

Tacoma's big advantage over Seattle, other than the interdependent chemical plants themselves (both cities have ample water and power), is the greater availability of land. RCI, for example, has had to operate in Seattle on land leased from the government. But in Tacoma it had no trouble buying a waterfront industrial site from the Port of Tacoma, which has re-



Lumber is king in PNW chemical trend.

## Prime Chemical Producers in Pacific Northwest

### WASHINGTON

#### Seattle

Air Reduction Pacific Co.  
American Marietta Co.  
Borden Chemical Co.  
Bunker Hill Co.  
Chemithon Corp.  
Linde Co.  
Liquid Carbonic  
Manufacturers Mineral Co.  
Monsanto Chemical Co.  
Mora Chemical Co.  
National Cylinder Gas  
Pacific Chemical Mfg. Co.  
Pacific Powder Co.  
Reichhold Chemicals Inc.  
Stansbury Chemical Co.

Washington Labs. Inc.  
Westport Chemical

#### Tacoma

American Smelting & Refining Co.  
Balfour, Guthrie & Co., Ltd.  
Hooker Chemical Co.

Ohio Ferro-Alloys Corp.  
Pennsalt of Wash.,  
Division Pennsalt Chemicals  
Purex  
Reichhold Chemicals Inc.  
Stauffer Chemical

#### Kent

Borden Chemical Co.

#### Everett

Donald A. Dodd Co.

#### Du Pont

Du Pont Co.

#### Anacortes

General Chemical,  
Division Allied Chemical Corp.

#### Frederickson

Olin Mathieson Chemical Corp.

#### Bellingham

Pugel Sound Pulp & Timber Co.

#### Renton

Republic Creosoting Co.

#### Roche Harbor

Roche Harbor Lime & Cement Co.

Acetylene, nitrogen, oxygen  
Adhesives, resins  
Resins  
Litharge, red lead  
Synthetic Detergents  
Acetylene, oxygen, nitrogen, argon  
Carbon dioxide, acetylene, nitrogen, oxygen  
Barites, strontium  
Resins, adhesives, crude vanillin, rosin sizing  
Zinc sulfate, zinc dust, forest fertilizer pellets  
Hydrogen, nitrogen, oxygen, compressed air  
Industrial cleaning compounds, methyl esters  
Industrial explosives  
Formaldehyde, resins  
Adrenalone; adrenalone hydrochloride,  
racemic epinephrine; epinephrine bitartrate,  
racemic epinephrine hydrochloride  
Vitamin A  
Defoaming agents

Sulfuric acid, black arsenic, nickel sulfate  
Resins  
Chlorine, hydrochloric acid, sodium hydroxide,  
ammonia, trichlorethylene  
Alloys  
Sodium hydroxide, chlorine, hydrochloric acid,  
hydrogen, arsenate  
Sodium hypochlorite solution  
Formaldehyde, resins, pentachlorophenol  
Ammonium phosphate sulfate, single  
superphosphate

Formaldehyde

Racemic epinephrine

Ammonium nitrate, industrial explosives, nitric acid

Sulfuric acid

Industrial explosives

Industrial alcohol, concentrate lignin

Creosote oil

Calcium oxide, calcium oxide hydrated

### BRITISH COLUMBIA

#### Barnet

Allied Chemical Co., Ltd.

#### New Westminster

American-Marietta of Canada, Ltd.  
Green Valley Fertilizer & Chemical Co., Ltd.

#### Vancouver

B. C. Distiller Co., Ltd.,  
Gypsum, Lime & Alabastine, Ltd.  
Javex Bleach Co., Ltd.  
Imperial Oxygen, Ltd.  
Linde Co.  
Liquid Carbonite Canadian Corp.,  
Canadian-Liquid Air Co., Ltd.

Sulfuric acid, aluminum sulfate

Resins  
Single superphosphate

Industrial ethyl alcohol  
Calcium oxide, calcium oxide hydrated  
Sodium hypochlorite solution  
Oxygen, nitrogen, acetylene  
Nitrogen, acetylene, oxygen  
Carbon dioxide  
Acetylene, nitrogen, oxygen

#### Victoria

Canadian-Liquid Air Co., Ltd.

Acetylene, nitrogen, oxygen

#### James Island

Canadian Industries, Ltd.

Explosives

#### North Vancouver

Electric Reduction Co. of Canada, Ltd.

Sodium chlorate

#### Port Moody

Reichhold Chemicals (Canada) Ltd.

Resins

## ADMINISTRATION

claimed a large tideflats area for industrial development.

Nonetheless, Seattle is moving ahead with similar development of the Duwamish Valley, south of the city, though desirable industrial property is sometimes hard to acquire. Seattle officials hope that private capital will develop the valley, opening new areas for industrialization.

**Seattle Research:** Although out-produced, Seattle probably will continue as the chemical research center of the Pacific Northwest, although Tacoma also will have extensive research facilities. Latest example of Seattle's research growth: dedication last month of two new laboratories—the facilities of the University of Washington and the \$1-million research center of the American-Marietta Co.'s adhesive resin and chemical division. Seattle also is the leader in resins production, from the plants of RCI, American-Marietta, Monsanto and Borden (which also produces formaldehyde at nearby Kent), although RCI is expected to eventually transfer all its production facilities to Tacoma.

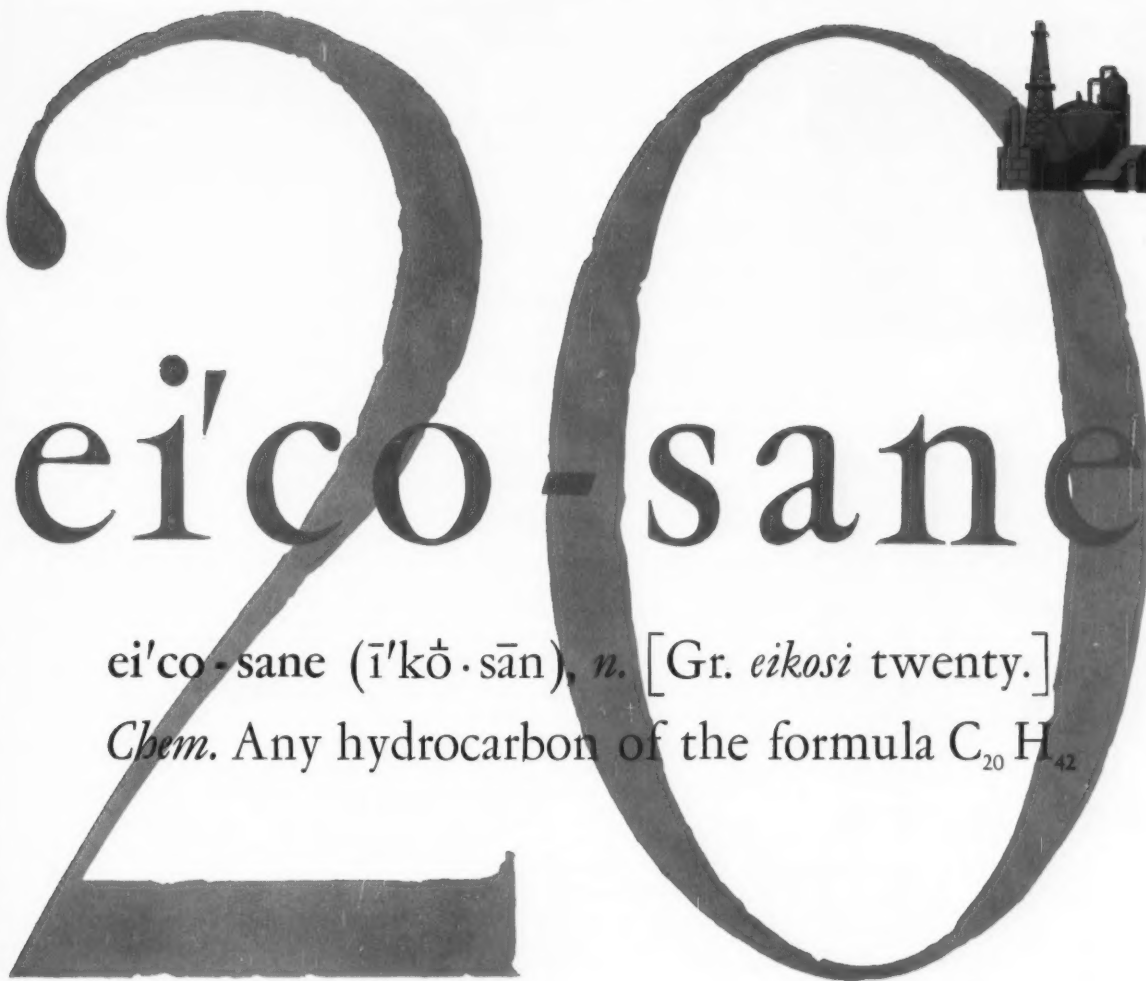
**Business Good:** Over-all business in the PNW chemical industry this year has gained over last year's, but it's not booming, as it is in other parts of the country. On the other hand, when most sections of the country were experiencing recession in '58, the Pacific Northwest had few woes, enjoyed good business.

Resin makers in the area, in the first six months of '59, reported sales up 20-40% over those of last year, which was also a good year for them. However, because of extremely tight competition, they're finding it hard to keep profits level with last year's.

Papermakers are reporting new production records in the first six months of this year. But, because of overcapacity, there's still some way to go before earnings will reach record levels.

**B. C. Bidding:** Meanwhile, the Vancouver area of British Columbia plays an important role in the PNW. The economy of the Canadian province is comparable to the U.S. Pacific Northwest in many respects. Both areas have many of the same natural resources and both have a manufacturing pattern based on the utilization of local resources. The future economy of both is expected to be an

# 20 eico-sane



ei'co·sane (ī'kō·sān), *n.* [Gr. *eikosi* twenty.]

*Chem.* Any hydrocarbon of the formula  $C_{20}H_{42}$

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Atlantic's Technical Eicosane is now adding a sales plus to many products: in compounds for flameproofing fabrics; in

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For more information on Technical Eicosane, write or wire Chemicals Division, The Atlantic Refining Company, 260 South Broad Street, Philadelphia 1, Pennsylvania.

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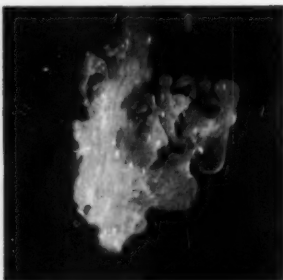
PHILADELPHIA    PROVIDENCE    CHARLOTTE    CHICAGO    LOS ANGELES

In Canada: Naugatuck Chemicals, Division of Dominion Rubber Company, Ltd.

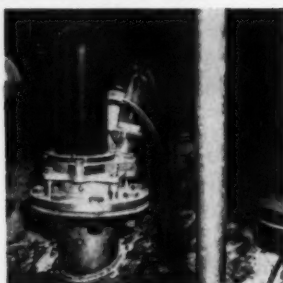
In Europe: Atlantic Chemicals SAB, Antwerp, Belgium

In South America: Atlantic Refining Company of Brazil, Rio de Janeiro

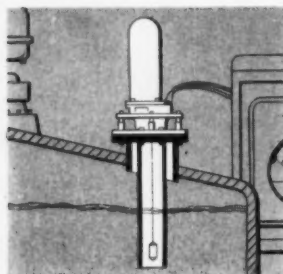
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## ADMINISTRATION

extension of present patterns.

Much of British Columbia's manufacturing is concentrated in the area around Vancouver. This location, called the Lower Mainland, accounts for the bulk of chemical production in the province.

Industry experts, looking ahead to British Columbia's growth, feel that even in '75 manufacturing activity will still be heavily dependent on wood processing in various forms. One official forecast sees a tripling of the chemical industry by '75, mainly due to fertilizer production.

But it's apparent that both Pacific Northwest areas — U.S. and Canadian — are affected by size of local markets and that both suffer from cost of transporting their products to market. Size of the local market in British Columbia is growing at a higher relative rate than in the U.S. Pacific Northwest (including Washington, Oregon, Idaho) — 3.2% per year vs. 1.8%. The total population in the former is nonetheless only one-third that of the latter. (In '57, population in the province was 1,487,000 vs. 5,131,000 in the three U.S. states.)

By '75, the Gordon Commission Submission (prepared by the Government of the Province of British Columbia) predicts the province's population will approach 3,005,000.

**Plywood Promising:** One of the chemical producers' biggest customers is the Douglas fir plywood industry, which turns out 80-90% of the nation's softwood plywood. National consumption is expected to more than double by '75, and the industry's consumption of resin-based adhesives likely will more than keep pace. This year, for the first time, value of the West Coast's plywood output will top that of lumber.

The area's adhesives plants now require annually about 75 million lbs. of phenol, 225 million lbs. of formaldehyde, 100-110 million lbs. of liquid caustic, 10-15 million lbs. of paraform, 30 million lbs. of urea and lesser amounts of resorcinol, pentachlorophenol, boric acid, formic acid, ammonia and ammonium chloride, ethanol and methanol.

Not all these chemicals will be made in or shipped to the Seattle-Tacoma area, of course.

American-Marietta, to cite one example, now produces resins at Portland, Ore., New Westminster, B.C.,

and Edmonton, Alta., in addition to output at Seattle, and plans to locate a new plant in the San Francisco area. RCI has a plant at Port Moody, B.C. Use of phenolic resins has almost doubled in the last seven years, is expected to increase at the rate of 8-10% year.

Resins also will be required increasingly in the production of hard-board, particle-board, insulating board, molded wood fibers and other products using wood chips, as well as in laminated products. Several timber companies are going to "end-gluing," in which short lengths of lumber are glued together to form long boards.

"Use of resin is only in its infancy," asserts Donald Redfern, American-Marietta vice-president. His company's current research at Seattle is directed into fields of plywood, composition boards, wet-strength and special papers, corrugated containers, pulp moldings, mineral wood, foundry and shell molds.

**Paper, Too:** The Pacific Northwest's \$600-million pulp and paper industry will continue to be a big consumer of chlorine and caustic soda. Hooker and Pennsalt both have plants in Tacoma, and the former has a plant in British Columbia. Large pulper Weyerhaeuser makes its own caustic and chlorine at Longview, Wash.

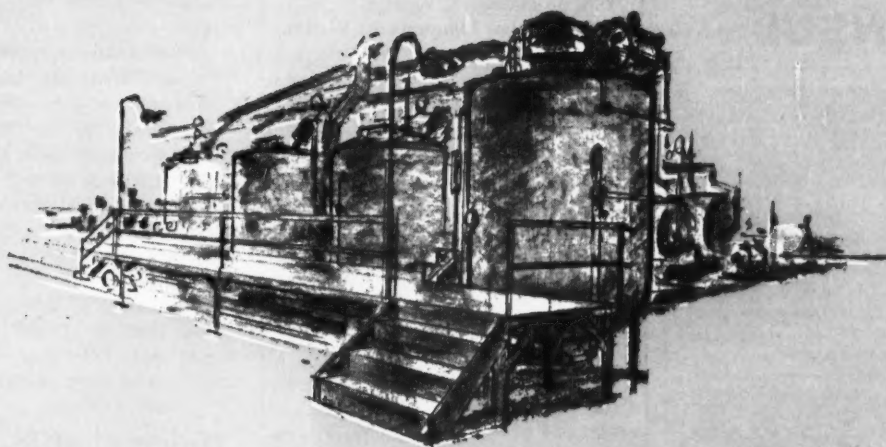
Although other caustic-chlorine producers have been keeping a sharp eye on this area as a potential site for a new plant, it's believed that current capacity can handle present needs of pulpers. Nevertheless, British Columbia will see some caustic-chlorine expansion. Pennsalt still has plans to build a \$10-million plant there. And Hooker admits it's thinking hard about expanding its facilities there.

**Paper Pointing Up:** Output of the state's pulp mills will likely increase at the rate of about 4%/year and the state's papermaking industry, now converting about two-thirds of the area's pulp, is expected to hike its output 50% by '65.

Some of the increased pulp output will go into new products and processes. Chemicals will be needed to give greater strength and quality to paper toweling, tissue and packaging papers. Wax and polyethylene are needed to coat special papers. Other

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sample quantities, our latest technical  
bulletins or problem-solving  
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#### Property Data

Molecular Weight	64.06
Specific Gravity	
Liquid.....Water=1@0°C (32°F)	1.434
Gas.....Air=1@0°C & 760 mm	2.2636
Melting Point...(-103.9°F)	-75.5°C
Boiling Point...(-14°F)	-10.0°C
Refractive Index	
Liquid....(I.C.T. 1, 107).....n <sub>20</sub> <sup>D</sup> /D (68°F)	1.410
Gas (Mellor, J.W. Vol. X, 197) n <sub>15</sub> <sup>D</sup> /D (59°F)	1.000686

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## ADMINISTRATION

types of paper are combined with plastics and foil. Heavy lumber sheeting panels are being faced with weatherproof paper.

To supply paper manufacturers in some of these areas of need, Monsanto has just completed a plant at Seattle to produce chemically fortified rosin sizing, which makes paper water-resistant. U.S. Oil and Refining Co. of Tacoma, which recently completed a \$750,000 asphalt plant, plans to make a special asphalt required in some types of papermaking for waterproofing and extra strength.

Growth of the pulp industry probably will be characterized by expanding use of the products of pulping. Puget Sound Pulp and Timber Co. (Bellingham), for example, currently is engaged in a \$400,000 program to double the supply of concentrated lignin from its pulp plant. It supplies lignins to Monsanto for use in Monsanto's Seattle vanillin plant, whose capacity recently was boosted 25% and which now accounts for half the U.S. production of vanillin.

**Washington Inducements:** Washington has a number of advantages as an industrial state, including low-cost power (less than one-half the rates of New York and Philadelphia) and extremely low property taxes. Washington is in 37th place in the nation in property tax rates.

Handicaps, besides lack of markets, include the related one of high freight rates, which limit the market areas of the Puget Sound companies. In addition, risk capital is not always easy to find.

Labor rates in the state admittedly are high. But Gov. Albert Rosellini declared at a recent industrial recruitment meeting in Boston: "Dept. of Commerce statistics show that production by Washington labor is 15% higher than the national average."

One CPI veteran of the area believes the attitudes of expansion-minded chemical executives around the country have taken a favorable turn toward the Pacific Northwest in recent years. Even five years ago, he feels, most chemical companies were skeptical of the idea of locating a plant there. Now, most firms are convinced that, if economics warrant, they should consider building in the area. The changing pattern in the PNW is a mark of progress, a big stride forward in the past five years.

## LEGAL

**Trade Secrets Suit:** In another litigation destined to add to the legal precedent covering the relationships between a company and its former employees, Melpar, Inc., has sued two of its former employees and their new firm for \$500,000, charging unfair competition. Melpar is a subsidiary of Westinghouse Air Brake.

The suit, in the U.S. district court at Alexandria, Va., centers on information regarding Melpar-developed inventions known as the "mixed-base concept." It alleges wrongful appropriation of secrets, proprietary data and inventions by the defendants, Scope, Inc., its employees Richard Williams and Jonathan Broome, formerly employed by Melpar (Falls Church, Va.). The complaint claims that Scope "has begun to exploit Melpar's mixed-base inventions and technology without permission, attempted to hire members of the Melpar staff familiar with the concept."

**P&G Lottery:** Procter & Gamble Co. of Canada Ltd. has been cleared of charges of conducting and advertising a lottery. The charges stemmed from a company plan allegedly promising that a percentage of the firm's products would contain a form that could be filled out and redeemed for \$5. The magistrate, in dismissing the charges, said that the forms were a sincere effort to get customers' opinions, that no "draw" was involved, and that the same amount was awarded to all respondents.

## Union Shuffle

**Oil, Chemical & Atomic Workers International Union (AFL-CIO)** has set up a special administrative and service structure for its Canadian district. Significantly, the reorganization — scheduled to go into effect around mid-November — reflects the steady growth of Canada's chemical process industries.

OCAW's Canadian district will differ in makeup from the union's 15 U.S. districts. Instead of having one district director supervise all International Union work in Canada, there will also be two assistant directors, each responsible for half of the Dominion's union activities. The change

was made possible by an amendment last year to the union's constitution.

OCAW President O. A. Knight said the new setup recognizes the main respects in which the Canadian district differs from U.S. districts: membership in Canada is spread through isolated communities in six provinces, from Montreal to Vancouver; locals in various areas operate under conditions and laws that vary considerably.

## LABOR

**Westvaco Strike Ends:** A 36-day strike at Food Machinery and Chemical Corp.'s Westvaco plant at South Charleston, W. Va., has ended with union acceptance of a new two-year contract. The 750 members of Local 12625, District 50, United Mine Workers, voted for a contract calling for an immediate 13¢/hour raise and an additional 9¢/hour in '60. The pact also includes 12¢ and 18¢ shift differential raises over the two-year period, plus improved pension benefits. The strike followed expiration of a three-year contract that ended a 46-day strike in '56.

**J. T. Baker Contract:** J. T. Baker Chemical Co. (Phillipsburg, N.J.) has negotiated a new two-year contract with Local 13262, District 50, United Mine Workers. The contract covers some 340 maintenance and production workers, calls for a wage increase of 8¢/hour, effective immediately, 7¢/hour for the second year of the contract. Also included is a major medical insurance plan, paid for by Baker, covering employees and their dependents.

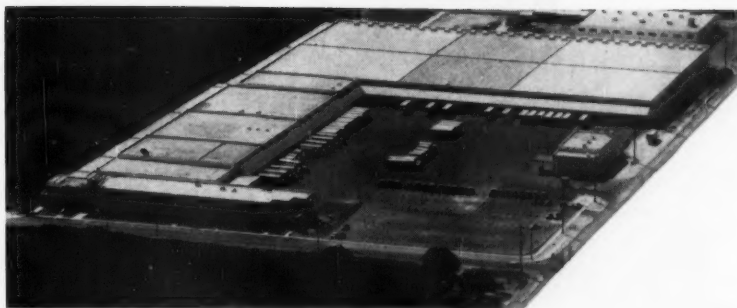
## KEY CHANGES

**Michael Maiese** to director of research and development, Ives-Cameron Co. (Philadelphia), division of American Home Products Corp.

**R. D. Waters** to president and general manager, Vick Products Division, Vick Chemical Co.

**Louis Amaducci** to vice-president, Norda Essential Oil and Chemical Co. (New York).

**Norman G. Gaylord** to vice-president, research and development, Polymer Division, Western Petrochemical Corp. (New York).



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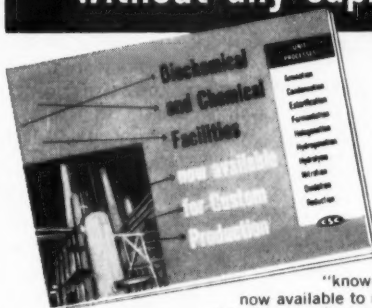
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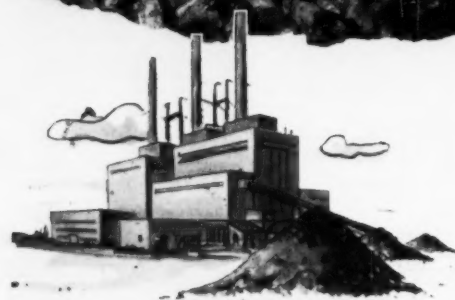
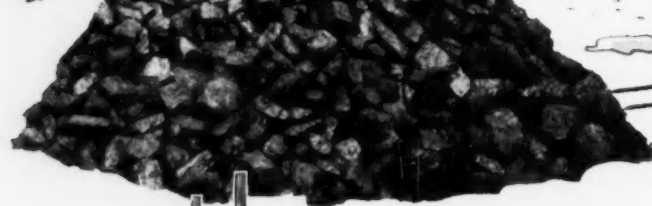
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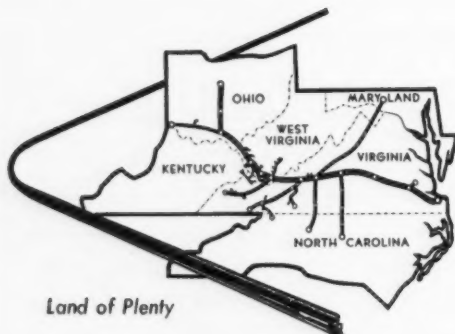
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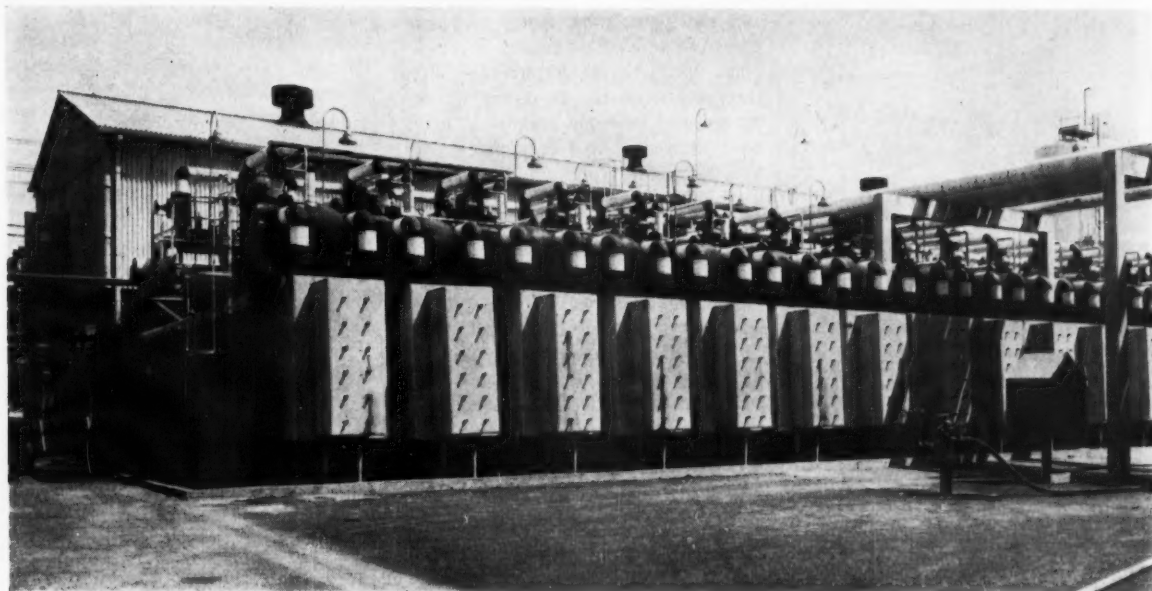
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Novel processing unit line-up at Atlantic Refining's \$10-million wax plant boosts output and quality.

## Modernized Plant Upgrades Wax Output

The Atlantic Refining Co., breaking wax-processing bottlenecks, is moving closer this week to its production goal of 250 tons/day of close-cut, low-oil-content paraffins. Key to the current buildup: a recently started \$10-million solvent dewaxing plant that replaces outmoded facilities at Atlantic's Philadelphia refinery.

Atlantic decided to undertake a major modernization and expansion program when it found its older plant unable to keep up with growing wax demands (see p. 91). Outmoded equipment included plate-and-frame filter presses, which had been used for over 50 years, and "sweat ovens" (for final deoiling of refined slack wax), which were nearly as old. Despite fairly recent additions of emulsion dewaxing facilities and a vacuum still for slack wax treatment, the sweat ovens were unable to keep up with the trend to lower-oil-content products without sacrificing capacity.

To cash in on its readily available supplies of wax-bearing crudes, the company decided to switch to a solvent dewaxing process. Its choice: a three-stage methyl ethyl ketone unit, employing the Texaco solvent dewaxing

process. This is used for initial extraction of wax from distillates, for subsequent deoiling of the extracted product and for final fractionation of deoiled wax, according to melting point. Badger Manufacturing Co. (Cambridge, Mass.) engineered and constructed the plant, incorporated several novel features designed to improve product quality, operating efficiency, and to minimize maintenance. Here's how these innovations work in the new setup:

**Three-Step Refining:** Distillate fed to the wax plant is first diluted with solvent and passed through propane-refrigerated chillers to crystallize the wax. Chilling at all three stages is carried out in conventional double-pipe chillers, but each 12-pipe unit is inclined slightly from the horizontal to boost heat transfer by promoting rapid circulation and gas elimination. To simplify maintenance, the insulation-filled housings enclosing the chillers are provided with separately removable end compartments, which make return bends of each unit accessible without disturbing the major portion of the insulation.

From the first-chillers, wax mix is fed to primary filters, which separate

the wax from the solvent solution of dewaxed oil. Solvent is recovered by double-effect flash vaporization, followed by stripping with superheated low-pressure steam. Dewaxed oil is stored for further processing, may be used as base stock for paraffin oils, or as cracking stock.

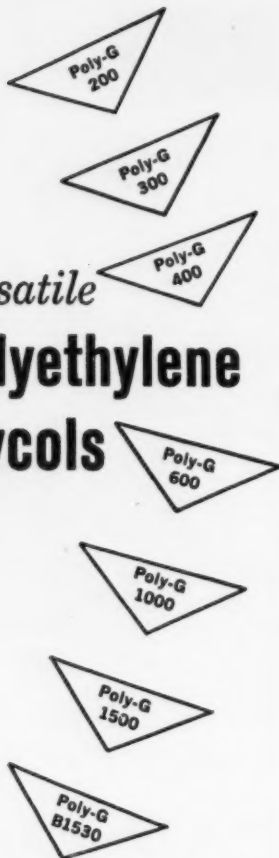
Since the new plant must handle a large number of charge stocks—including selected lower-boiling waxy distillates—multiple-bubble-tray fractionation is provided in each stage of the dewaxed oil recovery system to control solvent contamination. In all, three separate solvent recovery systems are used to maintain oil content at the necessary low levels.

Second stage of the operation involves repulping of slack wax from the primary filtration, followed by a second filtering step. This yields a filter cake of low-oil-content wax, and a filtrate of soft wax and oil in solvent. This stage departs from previous solvent dewaxing practices in that controlled heating and chilling operations have been added to improve repulping efficiency.

In the final stage, the hard wax is reheated to solution without stripping, then chilled to about 60 F, sent to

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## ENGINEERING

wax fractionation filters. High-melting-point waxes are recovered as filter cake, are sent on to acid treating and clay percolation, which turn out the fully refined wax. Low-melting-point waxes in the filtrate, plus the soft wax from the repulping filters, are sweated to crude scale wax, may be acid treated and clay percolated to a semirefined product. For added flexibility, the third-stage wax fractionation filters are grouped in such a way that they can be used for repulping when necessary.

**Building Features:** In addition to innovations in the process itself, Atlantic's plant also includes several other improvements designed to assure economical operation while avoiding common wax-processing bottlenecks. The filter building, for example, features a greatly simplified arrangement of filter feed, filtrate and vacuum piping, with filters and filtrate receivers supported at grade to permit all operations to be controlled from one level.

A new design used for the 700-sq-ft. filters increased the cost of these units, says Atlantic, but resulted in a lower-cost filter building. And pumping problems commonly encountered in earlier units employing rotary pumps to handle cold wax-solvent slurries at the filter boots have been overcome by using centrifugal pumps.

Inert gas used for blanketing the solvent dewaxing units is generated continuously at the rate of 2,000 cu.ft./hour from the combustion of low-sulfur-content fuel gas in a flue gas generator. Since there are times when sweet gas isn't available at the refinery, Atlantic included provisions for a caustic soda cleanup system. This removes hydrogen sulfide from sour refinery gas to avoid corrosion problems and to ensure high-quality, odor-free wax. For added safety, the flue gas is continuously monitored by an oxygen analyzer that sets off an alarm if oxygen content exceeds 2%.

**Gradual Buildup:** To date, Atlantic hasn't run all of the eight basic types of charge stocks its new plant is designed to handle. Nor has it run any one material at the plant's full capacity. However, it's planning to build production up gradually and, on the basis of two months' operation, expects "no difficulty in achieving desired product quality or in meeting design charge rates."

## Pure Silicon to Japan

Two Japanese firms have acquired rights to produce semiconductor-grade silicon by European processes that are currently being used under license in the U.S.

The Mitsubishi enterprises plan to use the Pechiney process, now employed by International Metalloids (jointly owned by Pechiney and W. R. Grace & Co.) at Toa Alta, Puerto Rico. The Shin-Etsu Chemical Co. is licensing the Siemens process, which is currently being used in this country by Westinghouse and Merck, and has also been licensed by Monsanto and Dow Corning.

Detailed plans have not been disclosed, although Shin-Etsu is understood to have a five-year contract that calls for a maximum annual production of 660 lbs. of silicon with a minimum resistivity of 300 ohm-cm. Both plants are expected to be in operation early in '60.

Other Japanese firms that expect to produce the material by other processes by about the same time include Tokai Electrode Co., Shin-Nippon Nitrate Co. and Osaka Titanium Co.

Japan's '58 imports (mostly from the U.S.) amounted to 104 lbs. of monocrystalline silicon, 922 lbs. of polycrystalline material. Big user of the high-purity silicon is International Rectifier Corp. Japan, Ltd., which has a monthly manufacturing rate of 3,000 rectifiers, 20,000 small silicon diodes, and a capacity triple these figures.

## Boost in Metal Studies

**Du Pont** is taking a major step toward becoming a major producer of semifabricated metals, has plans for a new metallurgical development center at Baltimore.

Scheduled for completion in the fall of '60, the new facility will be aimed principally at advancing the company's current experimental program in columbium and its alloys, and at developing techniques for forming titanium (which the company now makes commercially in sponge form). Du Pont's agreement with Thompson Ramo Wooldridge, Inc., to carry out advanced fabrication development studies on its columbium alloys will remain in force (*CW*, July 4, p. 51). Other metals that will be studied to a

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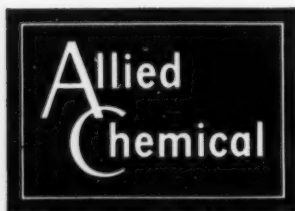
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## ENGINEERING

lesser extent: tantalum, zirconium, tungsten, chromium.

The Baltimore installation will include equipment for forging, extruding, rolling, drawing and heat-treating the metals. Among the units to be provided: a consumable-electrode arc-melting furnace, a vacuum annealing and heat-treating furnace, forging and extrusion presses and a hot- and cold-rolling mill.

Product forms sold will include ingot, tubing, rod, sheet, strip and foil.

The pigments department will be in charge of the new center, which will be located at its Baltimore titanium dioxide plant.

Supply of metals for the plant will come from the department's Newport, Del., plant, center of the company's titanium sponge production and the experimental work on columbium. Because of its expanded activity in columbium, Du Pont will increase the size of the Newport pilot plant for extracting and purifying the metal.

## PROCESSES

**Salt by Electrodialysis:** Electrodialysis will be used at a new salt-making plant of New Japan Chemical Co., subsidiary of Asahi Kasei Chemical Co. (Tokyo). Initially, the plant will produce 50-60,000 tons year of salt, at an estimated saving of 50% over traditional plants. Further cost reductions are expected after the plant size is increased.

**Heavy Water:** Construction contract for India's \$630,000, 14-ton/-year heavy-water plant at Nangal has been awarded to German Linde. The new plant, planned for completion in '60, will recover deuterium by distilling the hydrogen being fed to an adjoining ammonia plant. Meanwhile, the Indian government has become the first in the world to lease heavy water from the Atomic Energy Commission. It leased 15 tons for use as initial inventory in its new research reactor at Trombay.

**Soluble Protein:** Solvent extraction is being used by Blaw-Knox Co. (Pittsburgh) to produce a higher percentage of soluble protein from seeds than was previously obtainable. Conventional processing of soybeans, for instance, involves cooking the material

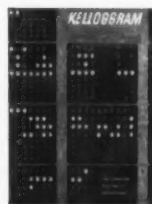
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ing process examined 19 alternates and re-checked suggested modifications of each. All this ordinarily would have required hundreds of engineering man-hours over a period of about two months. With the computer, only two hours of machine time and few engineering man-hours were required to determine the optimum design.

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## ENGINEERING

at high temperatures, which lowers soluble protein yield to 35%. The B-W process, operating successfully in a Japanese plant, raises this percentage to 80-85%.

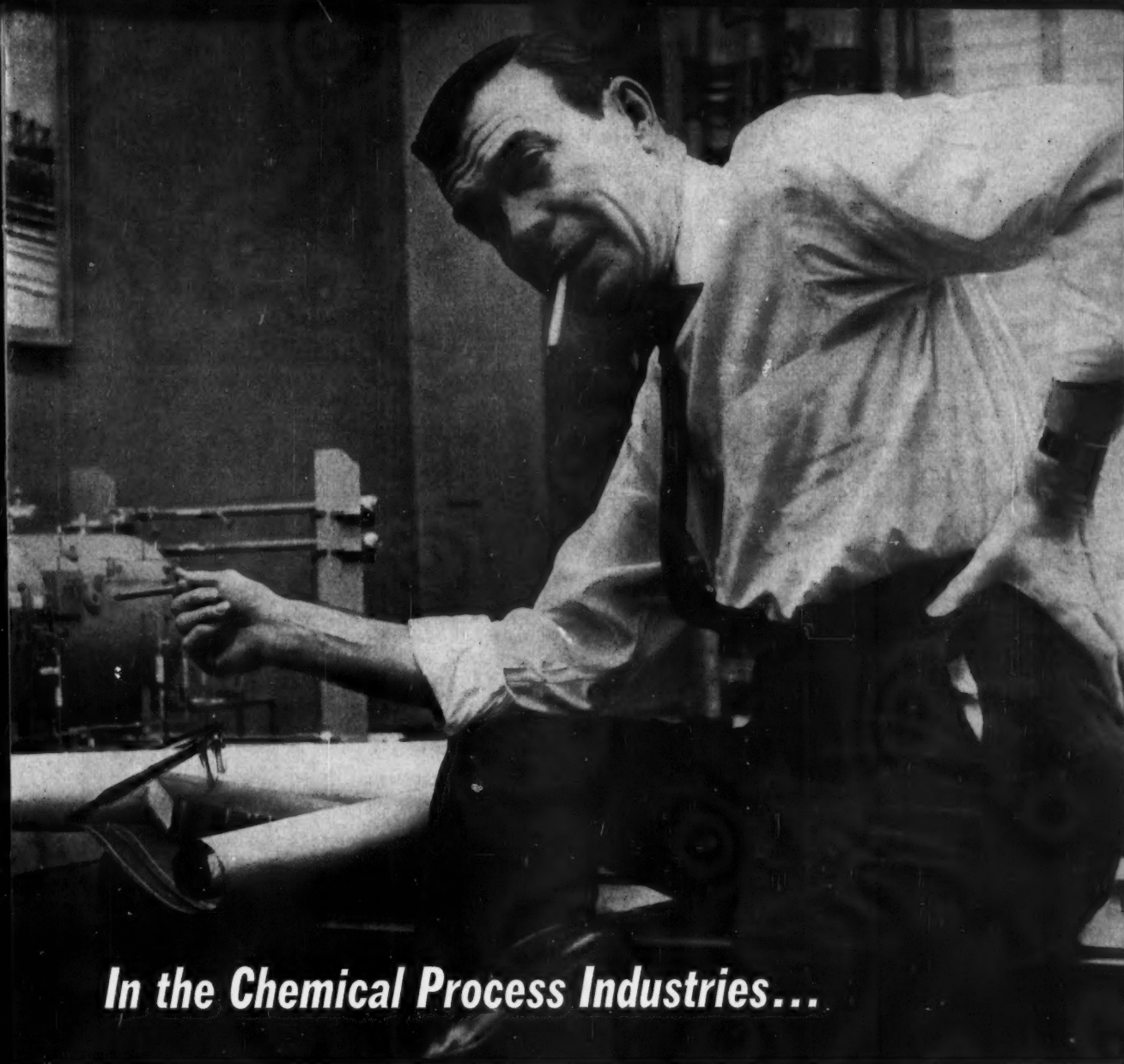
Key development was the adaptation of the company's vapor desolventizing-deodorizing process for treating the oil-extracted flakes at low temperatures. Blaw-Knox was also involved in the construction of VioBin Corp.'s solvent extraction plant at New Bedford, Mass., for production of high-quality fish protein (*CW*, May 16, p. 88).

**Aluminum Oxide:** A seam of clay covering a lignite deposit at Turoszov, Poland, has been found to contain commercially recoverable aluminum oxide. Key to efficient recovery is a new process, called the Bretsznajder method. Details are not available, but indications are that the process does not involve acid. Poland has no domestic source of bauxite, has been importing aluminum-containing materials from the Soviet Union and from Hungary.

**Polyvinyl Alcohol:** Kurashiki Rayon Co. (Tokyo) has added the French firm of Société des Usines Chimiques de Rhône-Poulenc to its licensees for process know-how on the manufacture of polyvinyl alcohol and vinylon fiber. (Air Reduction Co. is Kurashiki's U.S. licensee.)

Another Japanese company, Otsu Rubber Co. (Osaka), has successfully produced tires made with vinylon cord, plans to market them in the fall. Otsu claims its tires are about twice as durable and less affected by water than rayon-cord tires, less extensible and more heat-resistant than nylon-cord tires. Initial selling price will be competitive with nylon-cord tires, is expected to drop to the rayon-cord level with increasing production.

**Lactic Acid Purification:** The British firm of Bowmans Chemicals Ltd. (Widnes) has installed a continuous solvent extraction process at its Moss Banks Works for purification of lactic acid produced by fermentation. The fermentation product is purified by precipitation with sulfuric acid, ion exchange and distillation before treatment with the solvent, diisopropyl ether.



***In the Chemical Process Industries...***

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with a variety of evaporation rates

## SHELL TOLUENE

... for applications where very fast evaporation and high solvency are required.

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... has an exceptionally narrow distillation range, is slower drying than toluene.

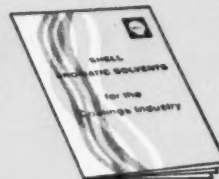
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... an excellent solvent with higher flash point and slower evaporation rate than xylene. Recommended for baking finishes and flow coating.

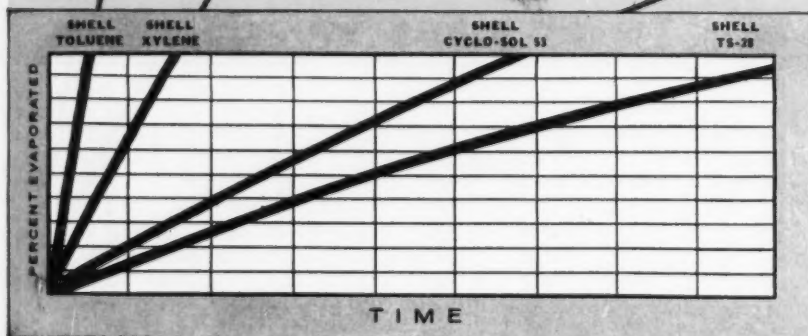
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## SHELL TS-28 SOLVENT

... a still slower drying aromatic concentrate of medium high solvency. Recommended for baking finishes and flow coating.



Typical properties are given in the booklet shown. Write for a copy.



These Shell solvents cover a very wide range of evaporation rates. Their individual characteristics satisfy specific requirements in a great variety of formulations.

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# Technology

## Newsletter

CHEMICAL WEEK

August 8, 1959

**Westinghouse's new germanium crystal-growing technique** was described last week as the first major step toward completely automatic, continuous manufacture of transistors and other semiconductor devices. The new method, developed by research physicists R. L. Longini and A. I. Bennett (*CW*, May 16, p. 54), produces germanium dendrites that have only one preferred direction of growth, therefore grow rapidly into continuous strips about 1/8-in. wide, a few thousandths of an inch thick, and almost unlimited length.

Fast, simple assembly of pinhead-size semiconductor devices can be achieved by constructing them directly on the mirror-flat surface of a single dendrite, then cutting the strip into pieces for individual mounting. The dendrite-growing process not only bypasses the tedious and complex procedures involved in making units from thin slices of conventionally grown germanium ingots but also provides superior physical properties. Westinghouse is currently developing devices from dendrites under a \$2-million "molecular electronics" contract from the Air Force Research and Development Command, predicts they may yield near-perfect semiconductor devices unattainable from conventionally grown materials.

•  
**A chemical reaction that directly forms filaments, films, tubes** or other extruded shapes is revealed in a new patent (U.S. 2,891,837) assigned to Du Pont. Liquid reactant consisting of a 3,3-bis(substituted methyl) oxetane, alone or mixed with a comonomer such as ethylene oxide or ethylene sulfide, is extruded into an inert fluid containing phosphorus pentafluoride. Polymerization is "immediate." The invention is valuable, says the patent, because it "provides a means of economically producing a continuous polyether-shaped structure without the numerous steps required in the dry-, wet- and melt-spinning processes formerly used." Products are said to have good tensile properties and high softening temperatures and are insoluble in most organic solvents at room temperature.

Such novel fibers are also the goal of "reaction spinning" research disclosed at a Textile Research Institute (Princeton, N.J.) seminar last year (*CW Technology Newsletter*, May 3, '58).

•  
**Standard Oil Co. of California's new isobutane plant is onstream** at its Richmond, Calif., refinery. The originally planned capacity of 2,000 bbls./day of isobutane (*CW Technology Newsletter*, Jan. 3) has been boosted to more than 3,000 bbls./day by use of a newly developed platinum-containing catalyst supplied by the process owner, Universal Oil Products Co. Key to higher butane conversion: the new catalyst allows operation at lower temperatures, which favor a higher equilibrium ratio of isobutane to n-butane.

•  
**A new quick way of testing the magnesium oxide content in** portland cement for quality control has been worked out at Battelle

# Technology

## Newsletter

(Continued)

Memorial Institute. Using radioisotopes, the system reduces test time needed from 28 hours to one hour. It was developed by Paul Schall, chief of radio isotope research at Battelle, under a \$45,000 contract from the Atomic Energy Commission.

**Malayan rubber growers are upping their research budget** 50%, to \$3.5 million/year. Sir Geoffrey Clay, controller of rubber research in Kuala Lumpur, Malaya, says plans for the new funds include establishing a technical service organization in the U.S., in the near future.

**Other Plans:** expansion of research facilities and coordination of tree, rubber, and related research.

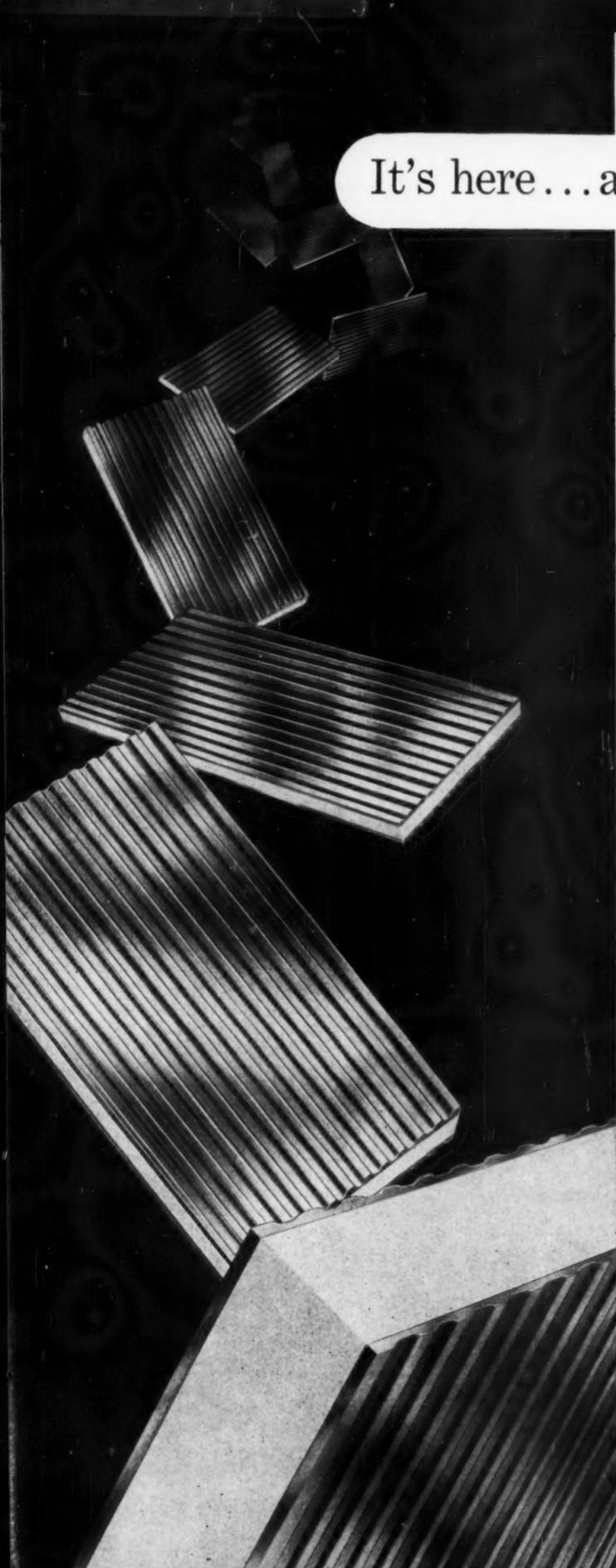
To help keep future markets, Clay reveals that "our scientists have in the pilot stage naturals that look and act like plastics. These can be used for cups and saucers, electrical outlets and similar purposes. We also have developed naturals that can be used for shoe-soleing and other leather substitutes."

Currently, natural rubber sells at about 36¢/lb., 13¢ more than GR-S. Estimates of the price of "synthetic" natural rubber (e.g., Firestone's Coral) range from 36¢-\$1.00/lb. in volume production. Clay feels that research will help natural rubber stay competitive.

**Salk polio vaccine producer Merck & Co.** (Rahway, N.J.) is stepping up production of the Sabin oral polio vaccine in order to "conduct extensive clinical testing." Merck simultaneously is upping production of Salk vaccine to meet current demand. And tests on a new, highly potent, purified polio vaccine of the Salk type are near completion. If tests are successful, the firm will apply to NIH for a license to manufacture and distribute the new vaccine in '60.

**The first fuel element** fabricated for possible use in the new plutonium recycle test reactor at the Atomic Energy Commission's Hanford Works is getting preliminary tests. It consists of a cluster of zirconium alloy tubes filled with unenriched uranium dioxide powder, compacted in the tube by vibration. Zirconium features corrosion resistance, desirable heat transfer properties, and is considered a good bet to get more popular in fuel element use. Sixty of the elements being screened for the \$15-million reactor will contain uranium dioxide, the other 25 will contain plutonium fuel in the form of plutonium-aluminum alloy.

**Beryllium metal components** up to 45-in. in diameter and 60-in. in length can be made with new equipment just installed at Beryllium Corp.'s Hazleton, Pa., plant. Key equipment at the plant includes three vacuum hot press furnaces, new powder-making equipment and various machine tools.



It's here... a new NIAX polyether  
... for lower cost  
rigid foams

Improved humid aging characteristics and reduced water absorption for rigid urethane foams are advantages you obtain by using a new CARBIDE polyether—NIAX Triol LK-380. Developed by CARBIDE's research program on urethane intermediates, LK-380 produces a rigid urethane, lower in cost than polyester-based urethanes.

Wherever a low-density, foamed-in-place urethane polymer is required, LK-380 should be evaluated. It can be used in partial pre-polymer or one-shot systems. Applications for LK-380-based urethanes include insulation for refrigerators and freezers; acoustical tiles; fabrication of sandwich partitions for construction, non-sinkable boats, life buoys and deck guards.

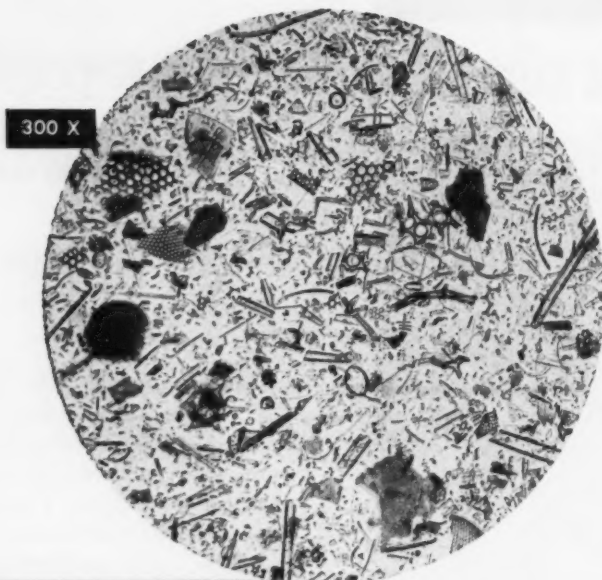
Triol LK-380, like CARBIDE's other NIAX diols and triols, is made to rigid specifications, offering you custom control of urethane properties. They can help improve your flexible, semi-rigid, or rigid foams, elastomers, coatings, and adhesives. Order by tank car, tank truck, or in 55-gallon drums in carload or LCL lots. Remember, you save money on combination shipments in compartment tank cars and tank wagons.

Get specifications and other technical data on NIAX Triol LK-380 and other NIAX polyols from a Technical Representative in any CARBIDE office. Or write Dept. HW, Union Carbide Chemicals Company, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.

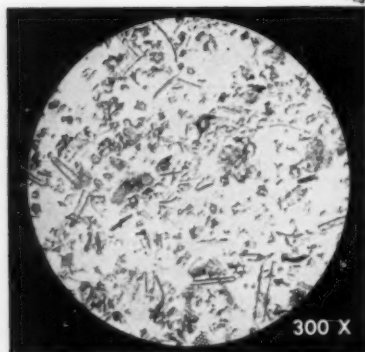
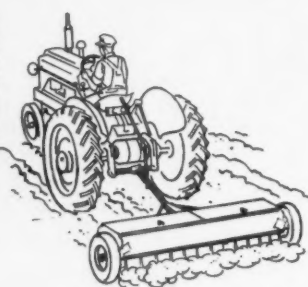
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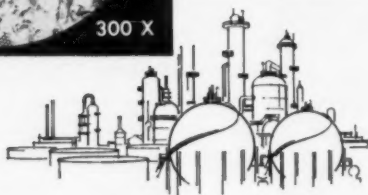
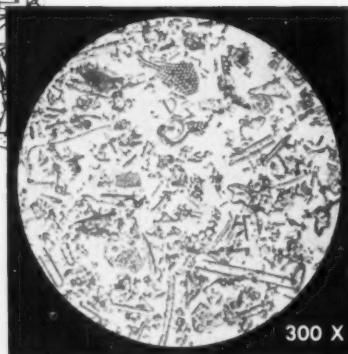
**For fertilizer coating—**Celite 379, a natural milled diatomite, provides the uniform conditioning needed to prevent caking of granular, mixed or prilled fertilizers—maintains good free-flow characteristics even after prolonged storage.



**For catalyst carriers—**Super Floss, finest particle size flux-calcined Celite grade, is used where a non-reactive porous silica support is needed. (Also available: special Celite supports in many preformed shapes for strength, high temperature stability, resistance to abrasion and attrition.)



**As a paint-flatting agent—**Celite 281, air-floated fines of flux-calcined diatomite, provides uniform and efficient flatting at low cost. Contributes to control of low angular sheen, durability, and faster drying.



**In diatomites, Johns-Manville precision processing works for you**

## **Celite diatomite absorbs its own weight of liquid... yet stays 'dry'**

No matter which of the many available grades you choose, you can depend on a given volume of inert Celite\* to retain its typical dry-powder characteristics even after absorbing its own weight of liquid.

Actually, Celite can absorb a total of more than twice its own weight. That's because a mass of the fine skeletal particles is approximately

93% air space or voids. Yet, in spite of this very high porosity, Celite is essentially non-hygroscopic.

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\*Celite is Johns-Manville's registered trademark for its diatomaceous silica products

# **JOHNS-MANVILLE**



# RESEARCH

## Explosives Shape Market in Metal-Forming

Having won a "substantial" new contract from the Navy Bureau of Aeronautics, Chromalloy Corp. (White Plains, N.Y.) is this week stepping up research on explosive forming of refractory metals—a long-known principle that's just now getting a realistic industrial tryout.

Already, products worth several million dollars are made each year by the technique, which carries various tradenames such as Explosiform (Chromalloy), Dynapak (Convair) and Aeroform (Aerojet-General), depending on particular modifications. And its use is expected to increase sharply, opening new markets for both explosives and metals.

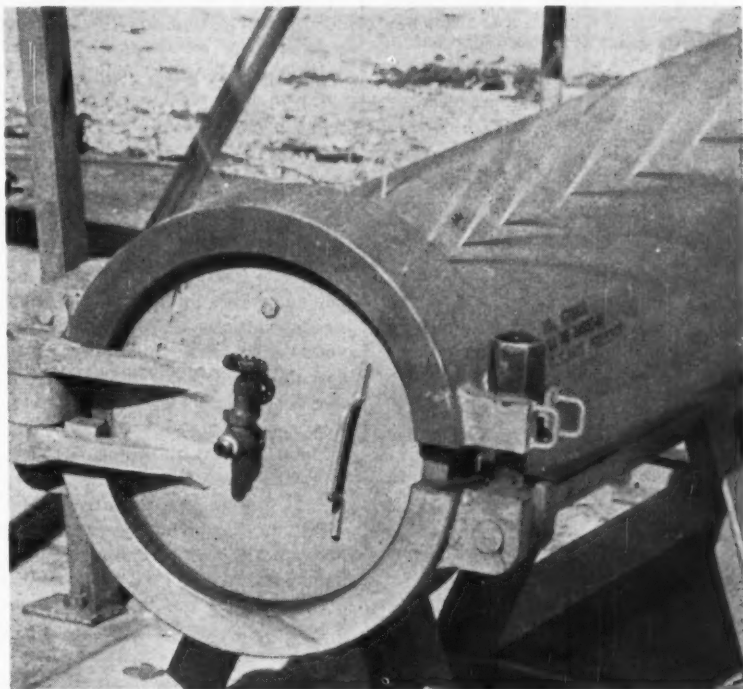
Essentially, the process consists of shaping metal parts, using an explosive or propellant as the energy source. A sheet, tube or cone of metal is held in a constraining die made of plastic or metal (or both) and is shaped to the die by force transmitted through a liquid, rubber or plastic medium. The force, initiated by the explosive, reaches up to 7 million lbs./sq. in., compared with 400,000 psi. achieved by the biggest hydraulic presses.

**Simple Equipment:** Unlike these presses, which may tower nine stories high and weigh 10,000 tons, explosive forming equipment is small, simple and inexpensive. However, a great deal of research will be necessary before the new process is competitive with presses for routine jobs. Logically, this research is being shared by companies with interests in both metals and explosives.

At Edwardsville, Ill., Chromalloy's Propellex Chemical Division is looking at a wide range of explosives, tailoring charges from such compounds as glycerine trinitrate, trinitrotoluene, trimethylene trinitramine, triethylene glycol dinitrate, tetramethylene tetranitramine, pentaerythritol tetranitrate, pentaerythritol trinitrate, and lead styphnate. At the firm's Chromalloy Division (White Plains, N.Y.), metallurgical research is focused on molybdenum, tungsten, columbium, tantalum, and their alloys, probing new assignments for these refractory metals in advanced



Chromalloy's Cooley shows blast-expanded heat transfer tube.

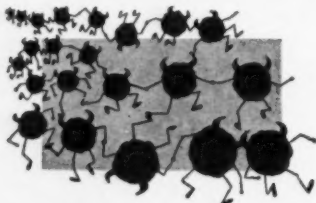


Water jets from this 18-in.-diameter die for rocket booster tubes under pressure from detonation of metal-shaping explosive charge.



### VERSATILE IMPS

Colloidal carbon—with particle sizes down to 7 millimicrons—can be a heat insulator or heat collector! . . . can make rubber, paper and a host of other materials better conductors! . . . can make the blackest inks, paints, plastics. A soft powder, it also improves abrasion resistance in rubber . . . and though carbon enters into millions of chemical compounds, colloidal carbon is essentially chemically inert!



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Thanks to the electron microscope, developed first in North America by Columbian for study of carbon black, we now know a great deal about how different kinds of colloidal carbons, of different sizes and characteristics, contribute a wide variety of useful qualities to many kinds of end products.



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## RESEARCH

gas turbine and ramjet engines and missiles.

Coordinating this research is Robert Cooley, an executive vice-president of Chromalloy and general manager of the Propellex Division. Cooley reveals that Propellex now makes eight nitrates having possible value in explosive forming, considers Propellex in an "ideal" position to scale up production if necessary. He has been working most recently with aircraft quality, high-strength steels. For example, Propellex is researching AMS 55-228 steel tubes 6-in. in diameter and 2-ft. long, studying the amount of expansion achieved with various charges. Cooley believes that explosive-formed tubes have an important future in heat exchangers and rocket casings.

**Short-Run Economics:** Economics is one reason for this research. Where only a few formed articles of a particular shape are required, they might be made for only \$2-3,000 for the necessary die and a few dollars for each charge of explosive. Jet-engine noise suppressor tubes, streamlined fuel tanks and rocket tubes are already being made this way. However, presses are still required to economically produce large numbers of an item such as an automobile bumper.

Furthermore, up to 30% increase in strength of metal can be achieved by explosive forming, compared with the hydraulic pressing of the same metal.

Brittle metals (e.g., chromium, molybdenum, titanium and tantalum), which are difficult to handle by conventional forming techniques, can be shaped with explosives. And expensive metal isn't lost, as it is in machining. Research looks most promising on intricate shapes such as nose cones and nozzles. Chromalloy is working with Boeing Aircraft to produce fuel tanks for the IM-99 Bomarc missile.

**Major Cost Item:** Research is still the costly item in setting up an explosive-forming production line. The shape of the charge determines the explosive pattern and pressure-time performance. Detonation velocity depends on the chemical nature of the charge. Propellex has tried as many as 10 different combinations of explosives to determine the best for a particular project.

Noise isn't a major problem, since

it is somewhat absorbed by the liquid (usually water) used and the die. But safety precautions are important since the explosives used can be highly sensitive.

Convair (San Diego, Calif.) is using its Dynapak explosive-forming process to extrude tungsten, feels the technique will "revolutionize" metal processing. Convair sells Dynapak units for \$18,500 to \$52,850, depending on size. So far, it has sold 15 units, including one to Du Pont for forming columbium and one to General Electric.

Aerojet says it is doing "quite a bit" of explosive-forming research, working primarily with molybdenum and tungsten. The firm finds it can get high densities—much higher than can be obtained with slip casting, for example—and is optimistic about making high-temperature-resistant components this way.

**Back to Basics:** An appreciable amount of basic research that should ultimately bolster the position of explosive-forming is also going on. Stanford Research Institute (Menlo Park, Calif.) has been researching high explosives and shock pulse phenomena for several years under direction of Thomas Poulter. Now Poulter is contemplating the establishment of a major research program in explosion-forming refractory metals at SRI, expects to have completed the plans in a few months.

While the explosive-forming principle has been known for a long time, it's just beginning to find its place in industry. Chemical companies may soon be cashing in on the process's belated but nonetheless bright career.

## EXPANSION

• American Machine & Foundry Co. (New York) has established a Research and Development Division for proprietary products. The division will consolidate as one corporate unit AMF's Chemical Research and Development Laboratory (Springdale, Conn.), Central Research Laboratory and Engineering Services Laboratory (both at Stamford, Conn.), the Advanced Development Laboratory (Buffalo, N.Y.) and the Research and Development and Commercial Development divisions at AMF headquarters in New York.

• Nuclear Data Inc. (Wheaton,

# Using Salt Efficiently

by INTERNATIONAL SALT COMPANY, INC.

## Only one salt dissolver delivers fully saturated brine at lowest cost

**It's the Sterling Lixator**—a fully automatic rock salt dissolver developed exclusively by International Salt Company for making 100% saturated brine from economical Sterling Rock Salt. The Lixator needs no maintenance. And it produces a rock salt brine so pure and clean that it can be used in numerous operations formerly thought to require evaporated salt. Here's why the Lixator is now being used in so many industrial plants . . .

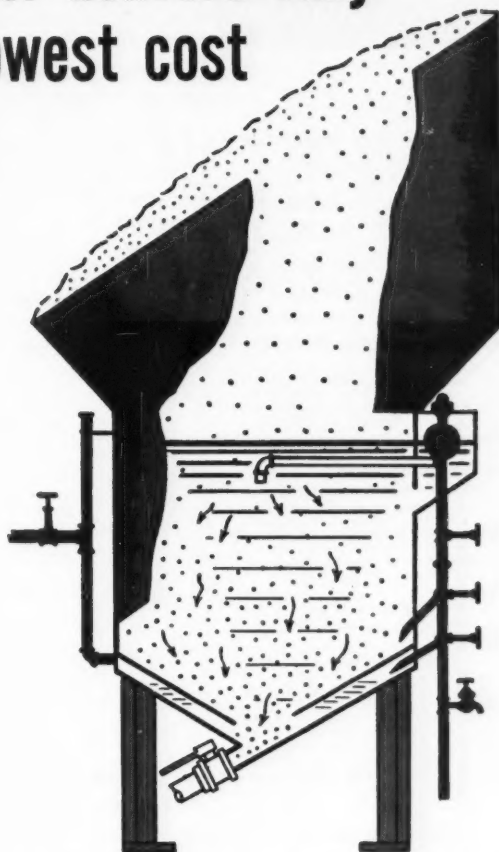
**Lixator has no moving parts**—nothing to get out of order.

**Downflow principle.** After water is admitted into the Lixator, it flows *down* through the rock salt in the dissolving zone.

**Brine is self-filtered** for maximum purity. There is no sand or gravel filter bed to bother with. Instead, rock salt crystals in the lower portion of the Lixator completely filter the saturated brine.

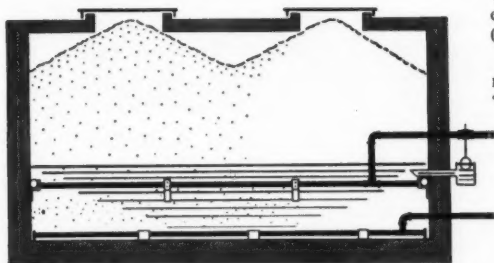
**Fully automatic.** Whenever brine is drawn off, water is automatically admitted into the dissolving chamber to make more brine. Rock salt flows in from a Lixator hopper or down a chute from an overhead bin. The only requirement is to keep the storage section filled with Sterling Rock Salt.

**Great flexibility.** The Lixator can be placed anywhere in the plant, at a point most convenient for salt delivery. *Pipes* deliver brine to points of use.



**Diagram of Sterling Model Lixator.** This is today's most widely used rock salt dissolver. It's available in many standard sizes—from 24" to 120" in diameter . . . with brine-making capacities up to 6,000 gallons per hour. Lixators come in enameled steel, Monel metal, or corrosion-proof plastic . . . with storage hoppers (standard low-lip, wall-type, cylindrical, corner, etc.) to suit any plant requirement.

For information on how your plant can save money with a Lixator, contact the nearest International Salt Company sales office. You can also get a free copy of "Brine for Today's Industry"—which fully describes the Lixate Process.



▲ **Diagram of Sterling Storage Lixator.** Designed for larger operations, the Storage Lixator is a combination salt storage, salt dissolving, and brine storage tank. On delivery, Sterling Rock Salt is unloaded directly into the Lixator. Lixate Brine is made automatically, as it is in every type of Lixator.

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**DISSOLVERS**

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less time . . . at less cost

### ☐ Faster, More Efficient Lime Slaking

Lime slurries as high as 43% lime are now being prepared with the Cowles Dissolver. Uniformity, improvement of the levelness of the slurry, freedom from small undrained lumps, faster preparation are just some of the advantages in the use of the Cowles.

### ☐ Excellent Dispersion in Glass Mould Lubricants

Ultimate dispersion of graphite in mineral oil to produce a homogeneous lubricant for moulds in glass plants is reported by prominent Cowles user. Method is economical and thorough.

### ☐ Higher Quality Casein Solutions

The COWLES provides extremely effective action in processing casein solutions used in paper coatings, rubber based paints, acrylic paints and similar materials. Unique action of patented impeller produces quality solutions in a matter of minutes in many cases.

### ☐ Costs Cut in Polyethylene Dispersions For Food Wrapping Materials

The COWLES Dissolver can be used to make dispersions at using concentrations or to make concentrates for let-down at time or site of usage. Concentrations as high as 50% of 12,000 MW polyethylene, 30% of 20,000 MW polyethylene and 30% of butyl rubber in waxes can be made. At these concentrations, either paraffin or micro-crystalline wax can be used as the vehicle. Using premelted wax, batches can be turned out on 30 minute cycles.

Greater Volume—  
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These results, plus lower space and costs, are routine, with the Cowles. That's why the Cowles is most in demand for ultimate dispersion, dissolving, emulsifying or deagglomerating in processing solid-liquid, liquid-liquid or gas-liquid materials. Ask the Cowles engineers for help on your problem. They'll show you why in mixing. . .

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## RESEARCH

Ill.), a new firm, will specialize in development and manufacture of electronic instrumentation with initial emphasis on radiation analyzing equipment.

• Stepan Chemical Co. (Chicago) has started construction of a \$1-million administration and research center. It will be completed in Jan. '60. The firm is a supplier of synthetic organic surface-active agents.

• Formica Corp., subsidiary of American Cyanamid, is building a research and product development laboratory at Evendale, O. The lab is scheduled for completion by early spring of '60. Formica's basic research will continue to be carried out at Cyanamid's central research division laboratory in Stamford, Conn.

• The California Institute of Technology (Pasadena) has received \$1,050,000 from Firestone Tire & Rubber Co. for construction of a new aeronautics laboratory. Research equipment will include plasma jets and shock tubes; a typical project will cover solid propellant design for missiles, rockets and space vehicles.

## PRODUCTS

**Eye Saver:** A new drug for treating glaucoma is the latest entry of Merck Sharp & Dohme (Rahway, N.J.). It's called Humorsol (demecarium bromide).

• **Four-Way Vaccine:** Parke, Davis (Detroit) is now marketing Quadri-gen, a four-in-one vaccine for protection against polio, diphtheria, whooping cough and tetanus (CW, July 19, '58, p. 61).

• **Amino Acid Kits:** Mann Research Laboratories (New York) has made available two DNP (dinitrofluorobenzene) amino acid kits for researchers. One includes 100-mg. samples of 18 different amino acids for \$90; the other contains 12 samples (100 mg.) of amino acids for \$60. Suggested use: protein chemistry research.

• **Electronic Aid:** Electronic-grade yttrium oxide, tailored for use in making yttrium-iron garnets, is now offered by Michigan Chemical Corp. It features 99.9% minimum purity, small particle size (nominally 2-5 microns), and high reactivity. Con-

tact: Rare Earths and Thorium Division, Michigan Chemical Corp. (St. Louis, Mich.).

• **Coal-Tar Entries:** Midland Tar Distillers, Inc. (Elizabeth, N.J.) now has research quantities of coumarone, hexamethyl benzene, 6-methyl picolinic acid, 2,3,6 - trimethylphenol, phenyl allyl ether, *p*-cumylphenol, and 6-bis-(trichloromethyl)-pyridine, among a variety of experimental coal-tar derivatives produced by the parent company in Birmingham, England.

## REPORTS

These reports are available from the Office of Technical Services, U.S. Dept. of Commerce, Washington 25, D.C.:

• The Atomic Energy Commission reports — "Analysis of Neptunium by Controlled Potential Chemistry" (HW-59447, 75¢); "The Heats of Combustion of Some Rare Earth Metals" (ISC-934, 50¢); "The Bismuth Trichloride System" (NAA-SR-3371, 50¢); "Lattice Defects in Transition Metal Hydrides" (NAA-SR-3452, 50¢); "Chemistry of Uranium, Collected Papers" (2 vols.) (TID-5290, \$7.25); "Free Energy Function for Gaseous Monoxides" (UCRL-8713, 75¢).



## Radiation Alarm

This pocket-size device is a novel self-contained, low-cost radioactive fallout detector and alarm. It was developed by Controls for Radiation, Inc. (Cambridge, Mass.), is called FIDO (acronym for fallout intensity detector oscillator). The device emits a loud whine in the presence of hazardous radiation. In "civil defense volume," FIDO is expected to sell for \$10-\$15, according to the firm's president, Irving Berstein.

# NEW G-54 GIRDLER CATALYST FOR IMPROVED SELECTIVE HYDROGENATION OF ACETYLENES



Here is another new, improved Girdler Catalyst... a development of our Research and Technical Service. G-54 is a promoted cobalt molybdate catalyst on an improved carrier for selective hydrogenation of acetylenes in raw olefin streams. Thoroughly tested and proven, G-54 offers these important benefits, compared to previously available catalysts, for this application:

- **Higher activity.** Permits greater space velocities... greater output and reduced operating costs with existing facilities. Reduces capital investment for new plants.
- **Greater flexibility.** Is selective and active over wider range of operating conditions such as feed gas composition, including variations in sulfur level.
- **Improved selectivity.** Less hydrogenation of olefins than with previously available catalysts.
- **No steam addition required.** Proven performance with increased cycle length, without addition of steam.
- **Longer cycles.** Minimizes polymer formation, extending periods between regenerations to 15 to 40 weeks.
- **Prolonged life.** Improved carrier and less frequent regenerations increase catalyst life.

*For further information contact...*

## GIRDLER CATALYSTS

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## THE MAN WITH THE MULTIWALL PLAN



**UNION  
PACKAGING SPECIALIST  
BOB BUCK**

**lowers  
customer's  
bag costs  
\$35,000  
annually**

A little weight reduction can go a long way in trimming Multiwall costs. Union Packaging Specialist Bob Buck demonstrated just how far during a study of one company's bagging operation.

The company had been using a baler bag of 160# total basis weight. Union's analysis proved that a 70/70 bag would be equally effective. The 20# reduction resulted in a savings of \$35,000 a year.

This economy came through Union's 5-Star

Packaging Efficiency Plan. Among the other improvements were: (1) A new, revised specifications manual which simplifies and streamlines inventory control. (2) Standardization of all bag printing. This assures delivery of completely uniform print copy from the firm's various suppliers.

Union's plan is producing thousands of dollars worth of savings for Multiwall users, large and small. It might point the way to a greater return on your packaging investment. Write for details.

### Union Multiwall Recommendations are based on this 5-Star Packaging Efficiency Plan



- DESIGN
- EQUIPMENT
- CONSTRUCTION
- SPECIFICATION CONTROL
- PLANT SURVEY

**Better Multiwall performance  
through better  
planning**



UNION'S PACKAGE ENGINEERING DEPARTMENT will study your Multiwall bagging methods and equipment and make appropriate recommendations, regardless of the brand of Multiwalls you are now using.

## UNION MULTIWALL BAGS

UNION BAG - CAMP PAPER CORPORATION  
233 BROADWAY, NEW YORK 7, N. Y.

# Market Newsletter

CHEMICAL WEEK  
August 8, 1959

**The U.S. maleic anhydride business is this week enmeshed in** heated controversy about overcapacity expected by '61. This had been predicted even before several companies revealed plans for maleic production (*CW*, Jan. 17, p. 82; July 25, p. 33).

Because some current producers won't pinpoint their maleic anhydride capacities, market researchers have been forced into wild guessing about forthcoming U.S. maleic potential. This helps explain why estimates for '61 differ by as much as 50 million lbs./year.

In view of the coming overcapacity, will Heyden-Newport or Pittsburgh Coke & Chemical give up plans for maleic units? It's obvious that if both come in on schedule, there will be overcapacity. Right now, both newcomers are sticking by their plans, and there is no official hint that either is ready to put off building its unit.

**"There isn't a pound of maleic anhydride sitting idle in any ware-**house," says one maleic marketer who predicts that supplies will continue tight in '59.

Next year, however, may bring a different situation—shortage will likely change to surfeit when American Cyanamid's new plant at Bridgeville, Pa., gets into capacity production. The expected abundance is considered large enough to make price reductions highly likely in '60. But there's not full agreement on this. Others say a price-depressing maleic excess won't come that soon—at least not before Reichhold goes onstream in mid-'60.

Incidentally, a Reichhold spokesman scotches trade talk that RCI will quickly junk its small 6-million-lbs./year maleic plant when its new and more efficient 20-million-lbs./year unit starts producing. Reason: the small unit isn't as inefficient as some observers seem to think.

**Puzzler of the week: Is another maleic producer on the way?** A West Coast firm is reported seriously considering producing maleic. *CW's* check of the firm—which prefers not to be identified—brought the comment, "such a move . . . would make sense at this time." In light of the impending national overcapacity, this optimistic view seems hard to explain but the company might be counting on a geographic advantage.

**Reports that Russian and East German potash** is now coming into Canada via the Seaway are giving domestic producers the worry of handling a new competitive situation. (Actually, there's still no tangible evidence of such shipments, and U.S. observers believe that potential potash importers are simply testing purchaser—and competitive—reaction.)

At any rate, some Canadian sources now suggest that Saskatchewan potash producers could shave transportation costs and sell potash under

## Market Newsletter

(Continued)

competitive conditions in the East. The gimmick: slurry potash with oil and send it east via pipeline—then separate the two products at the other end of the line.

But the potash-via-pipeline idea is shrugged off by U.S. potash marketers as "impractical"; the idea was considered years ago by Carlsbad, N.M., potash producers and was judged economically unfeasible. One reason: it would be too much trouble—and too costly—to separate the potash from the oil and clean it to make it marketable.

Nonetheless, some Canadian sources see hope in this system, point out that investigations are now under way on transporting wheat in oil pipelines.

Potash Co. of America will start production at its new Canadian plant at Saskatoon, Saskatchewan, sometime in November. Operation of the plant will be handled by Potash Co. of America, Ltd., the company's Canadian subsidiary. Cost of the new installation is \$22.5 million; it will be able to process about 4,000 tons of ore daily.

Texas Butadiene & Chemical's new propylene facility is now onstream—almost a month ahead of schedule. The new addition recovers propylene from the effluent of a Houdry butane dehydrogenation unit at the company's plant near Channelview, Texas. This material, an 80% concentrate, is used in manufacture of propylene oxides, glycols, polypropylene and the like, as well as high-octane gasoline blending components for TB&C's own aviation alkylate operation.

Propylene production is part of a broadening of the company's product line; only last week, TB&C revealed it had licensed Cosden's polybutene process (*CW Market Newsletter*, Aug. 1).

Price of radioiodine-131 has been cut 20-25% by the Atomic Energy Commission. In quantities up to 199 millicuries, the cost is now 40¢/mc. or 10¢ less than previously; in 200-499 mc. quantities, tabs are reduced to 35¢/mc. from previous 50¢; for amounts of 500 mc. or more, the new price is 30¢/mc., representing a 10¢/mc. reduction.

### SELECTED PRICE CHANGES—WEEK ENDING AUGUST 3, 1959

	Change	New Price
<b>UP</b>		
Amyl salicylate, cns., dms. ....	\$0.05	\$0.85
<b>DOWN</b>		
Ammonia, anhyd., fertilizer, tanks, ton .....	4.00	84.00
Ammonium nitrate, dom., fertilizer grade, 33.5% n, bags, ton	5.00	63.00
Mercury metal, 76 lbs. per flask .....	2.00	234.00
Cottonseed oil, crude, tanks .....	0.0025	0.1275

All prices per pound unless quantity is quoted.



## GET HELP WITH RESINS

from Neville's Technical Service Department

If you manufacture products in the rubber, mastic floor tile, paint and varnish, adhesives or paper industries, to name a few, the chances are you use coumarone-indene or petroleum resins in at least some of your formulae. As a leading source for these resins for many years, Neville continuously develops new variations to match ever-expanding applications. If you have been using the same resin types in your formulae over a period of years, are you sure you are still getting the highest quality results for the lowest cost? Why not let Neville's Technical Service Department help you

satisfy yourself? There will be no obligation or breach of confidence . . . only a letter or a phone call is necessary.

**Resins** — Coumarone-Indene, Heat Reactive, Phenol Modified Coumarone-Indene, Petroleum, Styrenated, Alkylated Phenol • **Oils** — Shingle Stain, Neutral, Plasticizing, Rubber Reclaiming • **Solvents** — 2-50 W Hi-Flash\*, Wire Enamel Thinners, Nevsolv\* • **High Purity Indene.**

\*Trade Name

**Neville Chemical Company, Pittsburgh 25, Pa.**

# NEVILLE

- ☐ Please have Neville's Technical Service Department contact me.  
☐ Please send information on Neville Resins.

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## Page from a chiseler's sales manual: 28 ways to adulterate,



### ADULTERATION—

1. Adulterate perchloroethylene with 7% to 15% high-boiling naphtha.
2. Cut trichloroethylene with 7% isopropanol or naphtha.
3. Dilute aromatic solvents with petroleum hydrocarbons. Example: dilution of toluene with 10% to 30% naphtha.
4. Blend methyl alcohol into isopropanol.
5. Water-down methanol and other alcohols, ethylene glycol anti-freeze, acetone, hydrochloric, sulfuric, nitric, formic and glacial acetic acid.
6. Add extra additive to quebracho extract formulations, represent 82% material as regular 90% grade.
7. Replace sodium phosphates in cleaning compounds by adding more sodium carbonate.

### MISREPRESENTATION—

8. Claim narrow (1-2 degree) distillation range for toluene and xylene that actually boils over 10-50-degree range.
9. Represent coal-derived benzene, toluene and xylene as petroleum-derived material and vice-versa.
10. Sell as ethyl acetate, a mixture of methyl acetate, isopropyl acetate and a little secondary butyl acetate.
11. Label, as safety solvent, 1:1 mixture of naphtha and chlorinated solvent. This permits underselling of safety solvents with normal, 70% or greater chlorinated solvent content.
12. Vend reclaimed solvents as virgin material.
13. Represent imported chemicals as domestically produced.
14. Represent off-specification or

## How Cheating Dealers Bid for Sales:

The unethical trade practices listed above are part of a list of over 40 cited by chemical distributors to *CW* in recent weeks. Although many of the cases are probably not common, they are by no means unknown to Midwestern and Eastern distributors.

In fact, jobbers tell *CW* that solvent adulteration, product misrepresentation, short-weighting and an amazing array of competitive pricing tactics are all a part of chemical distribution in many industrial marketing areas today.

Take metropolitan New Jersey, for example. There, only a few months ago, the purchasing department in a large municipality opened bids on 25 drums of mineral spirits. The winning jobber won the sale with a bid 7¢/gal. under his nearest competi-

tor. A runner-up in the bidding, fascinated by the "incredible low price," managed to obtain a sample, quickly discovered the flash point was 20 degrees below the city specification.

In Chicago, two leading distributors were plagued with unusually severe price-cutting on perchloroethylene. Picking up samples, they found the solvent adulterated with 7% to 15% naphtha. Boston and New Jersey wholesalers recount similar experiences.

In Pittsburgh, a domestic producer of chlorinated solvents reportedly found that its brand-labeled drums were being refilled with competitive material by a local jobber. The jobber was promptly dropped.

Acting on reports that unethical operations were proving a problem for

ethical chemical wholesalers, *CW* undertook a survey to check the situation. More than 100 distributors and 10 leading producers in a total of 21 different areas were interviewed. The goal was to learn what specific practices are in existence, how widespread they are, the effects and causes of unethical practices, and what corrective measures are feasible.

**Product Adulteration:** Chlorinated hydrocarbons, aromatic solvents and chemicals miscible with water are the lines most commonly adulterated, say distributors. Customers purchasing diluted materials are usually small firms lacking quality control labs and entirely dependent on the reputation of the supplier for quality. Detection, under such circumstances, is difficult.

The distributor cutting perchloro-

## misrepresent and manipulate pricing

reclaimed mineral acids and alcohols as prime-quality or first-run material.

15. Claim specifications for insecticides better than actuality.
16. Sell dextrose not guaranteed as "injectable" as "injectable specification" to foreign buyers.
17. Refill drums bearing brand labels of leading suppliers with chemicals of different supplier.

### PRICING—

18. Confuse customer with weight equivalence terms. Sell 50% caustic soda solution for \$2.25/100 lbs. This allows an extra profit because material is sold on a 100% basis for \$4.40/100 lbs.
19. Give customers cut price on toluene or xylene by diluting slightly, relabeling as "aromatic substitute."
20. Divert chemicals especially

low-priced for export markets to domestic customers.

21. Mark up chemicals in short supply (maleic and fumaric acids, phthalic anhydride) two or three times posted price.
22. Sell USP-grade chemicals as technical grade to cut price.
23. Give customers carload or truckload price on less-carload-lot size purchases.
24. Allow abnormally high refunds for return of drums.
25. Use reconditioned drum for shipment but charge customers for new drum.
26. Short-weight drums and containers to pay for freight costs.
27. Give customer cash refund as either bribe or means to cut price.
28. Claim rock-bottom price although the chemical is sold for less in the same market.

the wide-range material is sold for the full price of the narrow-range aromatic, but more often at a cut-rate price not fully commensurate with the lower quality.

Wide-range toluol, according to one prominent Chicago jobber, is sometimes labeled as "substitute" in barely readable type. Coal-tar aromatic solvents, other wholesalers report, are often billed as petroleum-based material and vice-versa. That's because a customer will occasionally insist on the specific origin of the product when the jobber has only the other to sell.

Solvent blends are another area "wide open for chiseling," wholesalers assert. They add that "anyone that offers a big saving on a blend is suspect."

So-called "safety solvents," used for metal cleaning, are a case in point. To qualify for the appellation, the blend should have at least a 70% chlorinated hydrocarbon content; the remaining fraction can be naphtha. Typical of the cutting prevalent on safety solvents, claims a Midwestern distributor, is this example: A "non-flammable, low-toxicity solvent blend" is from 40% naphtha and 60% an 85:15 mixture of carbon tetrachloride and chloroform. "A legitimate mixture of this type," he claims, would consist of 30% naphtha and 70% a 3:1 mixture of methylene chloride and perchloroethylene." The misrepresented material, he adds, is neither nonflammable nor nontoxic.

Falsely labeled solvents and mineral acids are a pesky marketing problem for some dealers in Chicago, Philadelphia and New York. Reclaimed acetone, acids, chlorinated solvents and alcohols are touted as virgin material. Some jobbers insist that the denaturants used in reclaimed ethanol sometimes fail to meet federal standards. (But the Treasury Dept.'s enforcement chief, John Latham, believes "we are containing the problem.")

Imported solvents—particularly perchloroethylene and trichloroethylene—are frequently misrepresented as domestic material. Sometimes, dealers say, the solvents are blended with domestic materials.

Even janitorial supplies are not immune to misrepresentation. The city of Detroit has experienced serious

## Phony Wares and Prices

ethylene with 7% naphtha gains a tidy extra margin, may either cut prices or pocket it as profit. The "steal" amounts to \$5.50/drum, based on a 30¢/gal. price for naphtha and \$1.80/gal. price for perchloroethylene.

Dilution of aromatic solvents such as toluene with straight-chain hydrocarbons is another practice widespread in some areas (Chicago, especially). A 50-50 mixture represented as pure toluol and sold at 29¢/gal. gives the dealer a 5¢ price advantage. Because a 50-50 mixture would be unsuitable in many applications, naphtha content is usually held to the 10-30% range.

Chemicals miscible with water, such as alcohols, acids, acetone, caustic soda solutions and ethylene glycol

solutions, are fruitful areas for the "chiselers." Nitric acid in 40-degree strength is sold as 42-degree material. Others report 99% glacial acetic acid watered down to concentrations of 80% and lower. And in New Jersey, watered-down methanol antifreeze and caustic soda solutions led one distributor to furnish salesmen with special instructions to cope with the practices (see cut, p. 86).

**Product Misrepresentation:** Aromatic solvents and solvent blends, say distributors, are especially subject to misrepresentation. Partially refined toluol or xylol, for instance, is described as boiling off over a 1-2-degree range, but jobbers in Eastern and Midwestern markets report that the material actually distills over a much wider, 10-50-degree range. Sometimes

**ANTI-FREEZE**

"P, Q" CONCENTRATED METHANOL ANTI-FREEZE

Is pure Methanol plus anti-corrosion and anti-foaming inhibitors.

The attached graph, therefore, indicates its prices on the 100% concentration column on extreme left.

To ascertain possible dilution of cheap competitive materials:

Establish price and quantity of competitive materials.

Assume it to be 40¢ per gallon for 10 drums.

Locate 40¢ line and follow to point where it crosses 10 = 24 drum price.

We find this point to be at the 80% mark indicating he is getting only 80% material.

80% of our 90% price for 10 = 24 drum deliveries is 40¢.

Therefore, at any concentration under 80%, 40¢ per gallon would actually be a higher price than our 90% per gallon for "P, Q" Concentrated Methanol Anti-Freeze.

July 24, 1959  
Replaces June 25, 1958 T.D.S. Anti-Freeze 104

**ALKALIES**

**90% LIQUID CAUSTIC SODA**

We have encountered some competition when quoting on tank wagon deliveries of Liquid Caustic Soda, which appears to be a bargain to the buyer, but when figured out really costs the buyer more money than when purchasing from suppliers quoting in accordance with standard industry practice.

One of our customers was quoted \$2.25 per cwt, net price for solution as compared with our price of \$4.40 per cwt., basis 76% Na<sub>2</sub>O content.

Since Liquid Caustic Soda solutions are not exactly 90% mixtures, the practice of the industry is to titrate each batch and charge for the actual solid (76% Na<sub>2</sub>O) content.

Listed below are various concentrations of Liquid Caustic Soda and the resultant cost per 100 Lbs. of solution when buyer purchases at \$4.40 per cwt., basis 76% Na<sub>2</sub>O content, as compared with purchasing the solution at \$2.25 per cwt, net.

Na OH Conc. %	Na <sub>2</sub> O Conc. %	Cost Per 100 Lbs. of solution when sold @ \$4.40 cwt, basis 76% Na <sub>2</sub> O	Overcharge when sold @ \$2.25 per cwt, net.	Per Cwt.	Per 26 gal T/W
50	36.74	\$2.24	\$1.01		\$ 1.83
49	37.97	\$2.19	\$1.06		\$13.13
48	37.19	\$2.15	\$1.10		\$24.42
47	36.42	\$2.10	\$1.15		\$35.47
46	35.64	\$2.06	\$1.19		\$46.48
45	34.87	\$2.01	\$1.24		\$57.16

SOURCE: AMERICAN OIL &amp; SUPPLY CO.

**These memos tell distributor sales staff how to cope with watered-down antifreeze and caustic soda.**

quality deviations in alkali cleaners. In a typical deviation from specifications, the soda ash content is increased from 10% to 20% while trisodium phosphate is pared from 70% to 60%. Alternatively, the city has found cases where tetrasodium pyrophosphate, called for in the specs, was eliminated. Detroit purchases about 180 tons of the cleaners each year. At that level, the quality-cutter realizes a \$270 advantage in the former case, \$900 in the latter.

**Easy Out?** How do unethical merchants cover their tracks? Mainly by insisting that the contaminant resulted from "poor drum cleaning, sloppy handling, inexperienced help or an honest mistake." In other cases, bribes are resorted to, adds a well known New Jersey wholesaler.

Some customers realize that they are purchasing adulterated chemicals but stick with the source of supply because of kickbacks or the price advantages, says a Chicago distributor.

The adulterated or deceptively labeled chemical often works as well as the legitimate material in the end-use. Moreover, the unethical jobber reportedly calls his shots carefully; a

naphtha-loaded toluol, for example, would not be sold for use in a critical paint formula.

**Pricing Practice:** Chemical distributor markets in most major industrial centers are fiercely competitive. It's "dog eat dog" in New York, a "nickel trading deal" in Chicago, and "strictly a price market" in Pittsburgh and Atlanta.

Commission-splitting is the most serious of price-cutting tactics. To qualify as a commission-splitter, the dealer will merely pass a healthy portion (often half) of his commission to the customer. Although the tactic is illegal under many circumstances, commission-splitting (or its variants) is widely reported.

Another serious problem vexing some wholesalers is sale of less-carload-lots of chemicals at the lower carload or truckload price. Many jobbers label the practice as unethical because the customer gets a discount that is unjustified economically. A few jobbers even consider unethical the filling of drums on a customer's premises from a tankwagon and at the tankwagon price. In some instances, the dealer "lends" the drums.

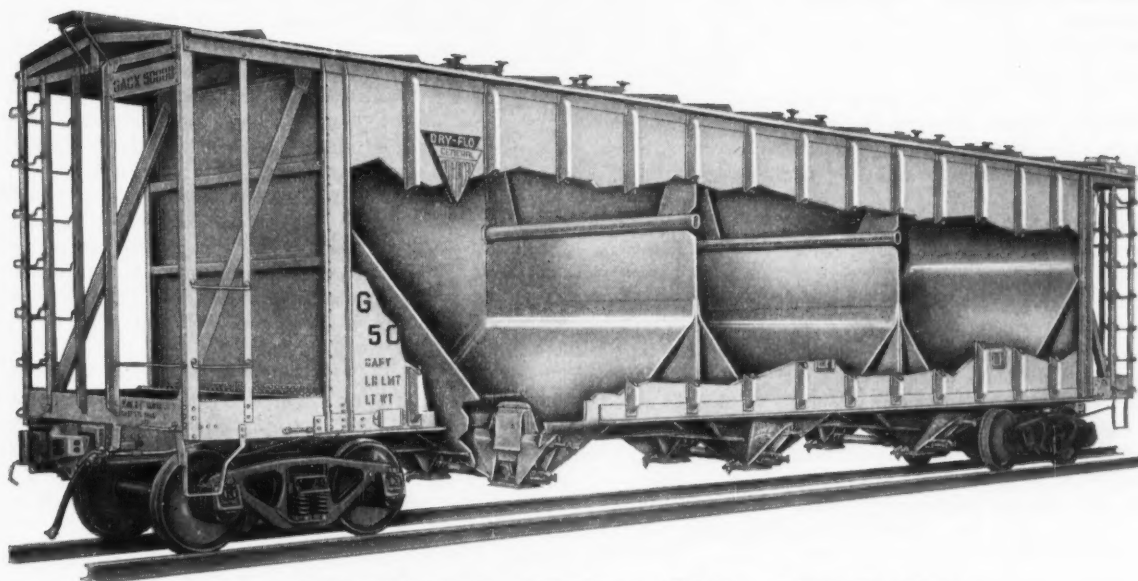
Pricing of toluene and xylene "substitutes," say merchant wholesalers, gives an odd, reverse twist to product adulteration. Several jobbers told *CW* that the pure aromatics are sometimes diluted slightly, vended at a cut price as a "substitute." It's a means of avoiding legal complications and the stigma of being called a "price cutter."

Distributors in Eastern seaports—New York, Boston and Philadelphia—complain of "export" chemicals that find their way, at cut prices, into domestic markets. (Chemicals offered for export can legally be priced well below domestic tags.)

Alkalis, aromatic solvents, fine organics, acetanilides, acetophenacetin, barbiturates, aspirin and even milk sugar are affected. Midwestern jobbers, as yet relatively unscathed by the situation, fear that the St. Lawrence Seaway may soon bring "export chemicals" to their doorstep.

Meanwhile, speculation on phthalic anhydride, maleic and fumaric acids is reportedly creating a black market. Prices are said to be two to three times the posted price. The shortage of the chemicals has been caused by the steel strike and lessened output of

Ship Chemicals, Food Stuffs, Feed Ingredients in bulk in the New



## DRY-FLO\* CAR

General American's new Dry-Flo car brings the economies of bulk shipment to many dry, granular or powdered products which otherwise require bags, drums or containers.

Competitive in price with ordinary covered-hopper cars, the Dry-Flo car keeps the lading contamination-free and seals it from the outside air.

The Dry-Flo car can be loaded easily and quickly by either pneumatic or

mechanical systems. Rounded hopper corners and clean interior lines eliminate hang-up points, insure complete discharge of product. Interiors can be coated.

All this adds up to important savings for shippers.

Consult us about *your* shipping problems. If you make, buy or sell dry, granular products, chances are you will profit from shipping by Dry-Flo car.

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## SALES

coal chemicals. One dealer charged that small consumers find it more profitable to sell the items at the inflated price than to use them in their own operations.

Cash rebates are often ascribed to unethical jobbers. Reported especially acute: chlorinated solvents. Rebates of \$5/drum are claimed to be "common."

**Packaging Capers:** Distributors assert that drums and carboys often figure into questionable practice. Short-weighting drums, for example, was fairly widely reported to *CW*. Said a New York dealer: "One fellow I know of adds about 7 lbs. on the invoice for each drum to pay the freight."

Containers occasionally serve as a way to slash price. Some dealers reportedly give an allowance well over the market price for returned drums. And others allegedly calculate prompt-payment discounts on the container deposit as well as the chemical.

A big controversy, however, centers on the practice of charging\* customers for a new drum while actually shipping the material in a cheaper, reconditioned drum. Some dealers condemn the practice as unethical; others defend it on the grounds that the used drum "is as good as new."

**Perspective:** Estimation of the extensiveness of unethical practice is difficult. Subjective factors—the unwillingness of many people to speak candidly, or a tendency of others to exaggerate faults of competitors—enter into any evaluation.

In the Chicago area, 8 of 11 jobbers interviewed admitted that some or all of the practices existed. A similarly high percentage was recorded among the 14 New York dealers contacted. Yet in Detroit, only one of eight distributors selling in the area regarded unethical marketing a serious problem. On the whole, about a third of the 110 dealers and 10 manufacturers contacted admitted to knowledge of unethical practice.

Despite the numbers claiming familiarity with the problem, it is likely that unethical resellers are a small minority in most areas. Of Chicago's some 50 major jobbers, for example, only about four are said to be "major offenders."

\*The price of a drum is usually figured into the price/lb. or total price a customer pays.

Yet their numbers and the scope of their activity is sufficient for an estimate that unethical practice is a severe problem in Chicago. Other sources peg the situation as moderate in St. Louis, Cleveland, and possibly Detroit, rare in Pittsburgh and "quite serious" in populous Eastern areas—New York, Boston, Providence and Philadelphia. Isolated indications of unscrupulous marketing gimmicks were picked up in New Orleans, Kansas City, Baltimore, Atlanta, and Houston. No indications of unethical practice developed in Buffalo, Louisville, Dallas, Seattle, San Francisco and Los Angeles.

**Root Causes:** Wholesalers blame fraud and deception on "marginal operators," "price-only" purchasing agents and short-sighted policies of some suppliers. A so-called "marginal operator" is often described as a dealer "where the president is owner, salesman, office clerk, warehouse hand and truck-driver." Such operators often lack adequate inventory, equipment and the ability to provide customary services furnished by reputable dealers. They can sell only by price and use it as a penetration device.

Purchasing agents also come in for a measure of criticism; excessive emphasis on price shrinks profits to the vanishing point, helps spawn shady dealings.

But if jobbers blame marginal operators and buyers as causes of the trouble, they point with equal firmness at chemical suppliers. Caustic criticism is leveled at sales policies that overconcentrate distributors in specific market areas, fail to discriminate between reputable and disreputable dealers. The "sell-any-jobber" attitude is also roundly condemned.

Criticism of suppliers goes even further. Jobbers complain of:

- Dumping of "distress" chemicals.
- Sale of allegedly "off-specification materials" at cut prices.
- Extra-long contract periods of price protection against price increases.
- Appointment of customers as distributors.

Add low-price imports to the situation outlined and the net effect, distributors say, is utter price chaos, thin or nonexistent profits and a powerful incentive to "wheel, deal

and chisel." The ultimate effect is to harm both producer and reseller.

Chaotic pricing leads to constant pressure on suppliers for "special help" in meeting specific situations. And misrepresentation and adulteration invalidates large producers' national advertising that aims to boost distributor sales and reputation.

For the reputable reseller, the situation is no less serious. Attenuated profits can force contraction in the services (inventory, bulk-breaking, fast delivery) that, from an economic standpoint, justify the role of a middleman.

**Cleanup Prospects:** What steps can be taken to bring maturity to distributor markets? Most proposals voiced by resellers take two broad directions:

- Increased quality-control testing by customers;
- More stringent policing of resale chemical markets by suppliers.

Ethical operators urge customers to "take a long second look" at exceptionally low-priced products. Customers should demand detailed data on specifications, quality guarantees, and lab testing by disinterested parties.

Because many small chemical consumers will never be able to test quality, however, distributors believe that producers must take the lead in stamping out the situation. Resellers strenuously urge suppliers to adopt more selective policies in choosing distributors and agents.

Special attention, they add, should be given to the wholesaler's reputation, facilities, capital investment and credit standing. And above all, jobbers ask that "marginal operators" be weeded out, that overconcentration of distributors in local markets be eliminated. Cuts in resale discounts, they say, are not the answer (*CW*, July 11, p. 43).

Would a national trade association for chemical distributors quash the situation? Many jobbers are opposed or lukewarm to the idea, but some feel it would at least be a start (*also see VIEWPOINT*, p. 11).

Whether associations, policing or testing by customers will turn the trick remains to be seen. Ethical distributors insist, however, that some constructive answers to problems of product adulteration, misrepresentation and unprincipled price manipulation are needed—and fast.



## X% IS PURE SULFURIC ACID...

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Send a sample of *your* Spent Sulfuric Acid to Stauffer for analysis and report. You will benefit from the massive experience of the largest spent acid regeneration facilities in the country...larger, indeed, than all others combined.

These facilities enable us to store and process spent acid wastes from the manufacture of lube oil, naphtha, DDT, benzene, alkylation, alcohol, white oil, detergent and other chemicals or from other manufacturing operations. Long experience and proved methods enable us to blend quantities and varieties of acid wastes in compatible burning mixtures from which we recover water-white sulfuric

acid. This is delivered to you by tank car, tank truck or barge ready for use at specified strengths precise to 1/10th of 1%.

Contract regeneration of spent sulfuric acid eliminates your problems of acid separation and concentration, air and stream pollution and maintenance of equipment.

Let's get together and discuss your acid waste problem so we can make proposals regarding method of collection and shipment, regeneration point, rate and cost of recovery, etc. "If you can pump it, we can regenerate it!"

### STAUFFER'S SULFURIC ACID FROM...

\*BATON ROUGE, LA. • \*BAYTOWN, TEX. • CORPUS CHRISTI, TEX. • FORT WORTH, TEX. • \*HAMMOND, IND.  
\*HOUSTON, TEX. • LeMOYNE, ALA. • \*LOS ANGELES, CALIF. • RICHMOND, CALIF. • TACOMA, WASH.

\*Regeneration Plants.



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## **URETHANE FOAMS**

Urethane foamed plastics—one of the most remarkable products to come out of wartime developments—has opened unlimited possibilities for new manufacturing techniques... new product designs... vastly better product performance. In bedding and furniture, in clothing and footwear, in aircraft and missiles, in refrigeration cars and trucks, in building panels and ships—in hundreds of places urethane foam fills the bill when nothing else can.

And no matter what the particular requirements—a foam that is rigid as rock, or soft as down, or flexible enough to stretch up to 700% its length without tearing or breaking—Nopco can meet them with the material *and* method sure to do the job best. For Nopco has amassed the experience to put these versatile foams to widest use.

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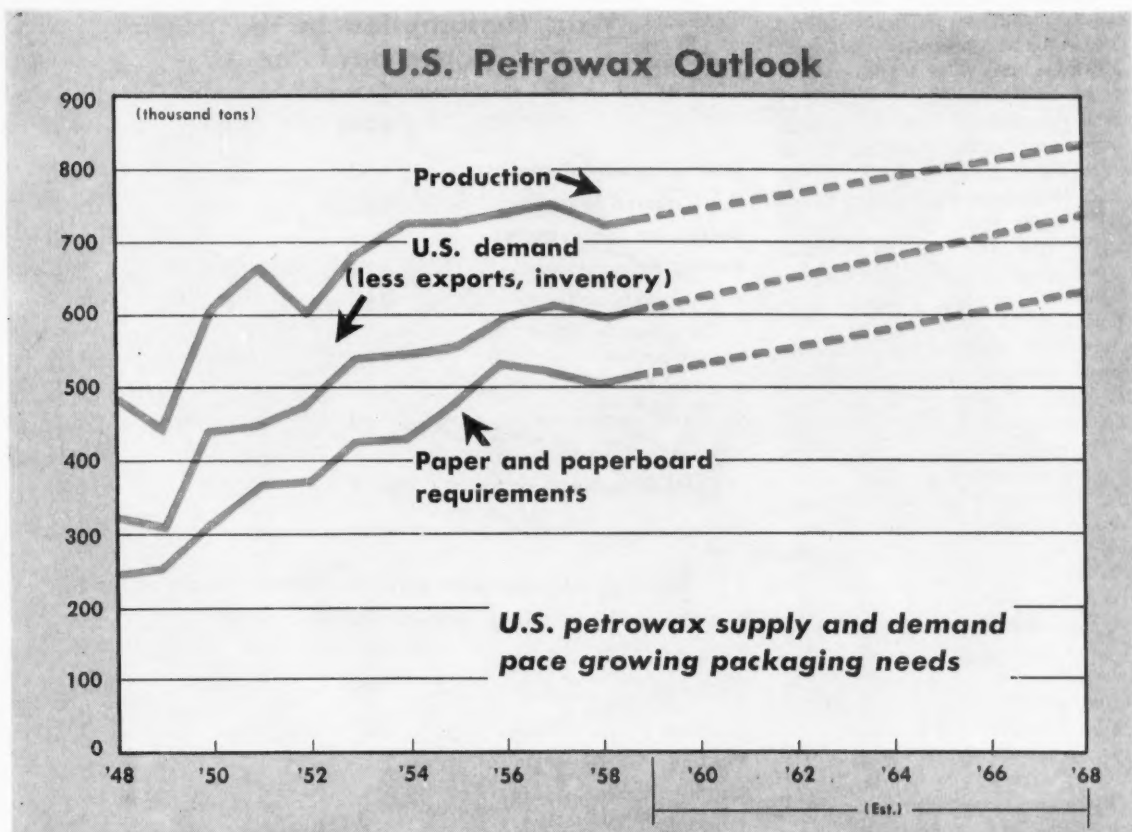


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# MARKETS



## Petrowax Makers Face Tough Competition

U.S. demand for petroleum wax will increase an estimated 25% in the next decade—far less than the big 83% growth scored over the past 10 years. Paradoxically, production will have to increase only about 16% to keep up with demand. Meanwhile, '59 is bringing a partial recovery from a recession-bred slump; wax output is expected to increase by 17,000 tons, demand by 18,000 tons, from '58 levels. These basic conclusions emerge from a CW probe of major wax producers.

CW's look at one broad report—a recent Sun Oil market study prepared by John Wood, Edward Bloom, Jack Brothers and Francis McNamara—reveals that Sun's opinions parallel predominant industry thinking about the reasons for an expected wax supply/demand balance:

- Plastics—particularly polyolefin

resins—present a definite threat to some wax markets. In the packaging field—which represents 80% of total wax demand—polyolefin film, coatings and containers will likely replace waxed paper and paperboard in many uses.

- Waxed paper and food board packages have already penetrated current markets deeply; hence, their growth will be comparatively slow.

- U.S. wax exports are expected to decline significantly as foreign countries become more self-sufficient in wax production. That's why only a 16% wax production step-up in the next 10 years will be needed to keep pace with the predicted 25% demand growth.

Although petrowax is used by a variety of manufacturers (see table, p. 92), the major consumer is by far the paper and paperboard industry;

trends in this area are therefore the key to future business prospects of U.S. wax producers.

Demand for wax for paper has grown more than 100% in the past 10 years—from about 250,700 tons in '48 to 512,800 tons in '58. This single industry took 80% of the total wax consumed in the U.S. in '58, 75% in '48.

Sun Oil's analysts peg growth at a little more than 2%/year in the next 10 years. By '68, it's estimated, the U.S. paper and paperboard industry will consume about 643,000 tons/year of wax.

The fastest-growing segment of the pulp, paper and board industry—and also biggest wax user—is the special food board field. Its needs now represent about 60% of total domestic wax demand.

Despite inroads of other coating

## MARKETS

processes, and some lessening of wax consumption in certain uses, food board demand is expected to increase 33% in the next decade.

**Measure of Milk Market:** Wax-coated milk and juice cartons represent a particularly important market area for wax producers—and one in which significant changes are taking place. Wax consumption in this use grew rapidly until '56, then sagged in '57 and '58. Reasons: Demand turned to high-density paperboards (especially one-half gallon containers), which absorb less wax. The switch from bottles to paper cartons slowed down. Plastic-coated containers began to make inroads.

Nonetheless, Sun Oil estimates that wax consumption in this market will increase to 270,000 tons in '68—a 27% rise over '58. Demand will be boosted because of a population growth of 30-35% in the milk-drinking, less-than-18-year-old group. Paper cartons' share of the total milk-container market will increase from 60% to 75%.

On the other hand, wax use per carton will be further reduced by use of higher-density boards; plastic coatings may take approximately 10% of this market.

**Estimates Vary:** Other wax marketers tell *CW* they agree, in general, with Sun Oil's conclusions about the future of wax in paper and paperboard applications. Some observers foresee many more plastic-coated containers in use by '68 than is indicated by Sun.

Sealright, the firm most active in developing plastic-coated milk cartons, figures that in the past two or three years its plastic-coated containers have won about 3% of the paper carton market.

While there's little doubt that plastic-coated containers will make further inroads, there is considerable disagreement as to how big these gains will be. Container manufacturers are also quite reticent about predicting or making plans known to wax manufacturers.

There's even uncertainty about current markets held by plastic-coated milk and juice containers. For example, one trade estimate put it at almost 6.5% of '57's total carton market, or more than double Sun Oil's estimate. In a recent article (*CW*, March 21, p. 106), *CW* found 4% a

### Wax consumption in the paper and paperboard industry

(thousand short tons)

	1948	1958	1968 (est.)
Milk, juice containers	81	212.5	270
Cups, nested containers	23.2	54.8	66
Butter, ice cream boxes	18	81.6	128.6
Frozen-food cartons	2.4	9.6	17.1
Misc. food board	19.3	25.1	30.4
Total special food containers	143.9	383.6	512.1
Glassine	18.1	20.2	23
Other waxed paper	76.7	85	72.9
Wax sizes and misc.	12	24	35
Total industry demand	250.7	512.8	643

### U.S. wax consumption—other than paper and paperboard uses

(thousand tons)

	1948	1958	1968 (est.)
Candles	24	34	45
Rubber	7.7	16.5	27
Chemical (chlorination)	9.5	12	15
Carbon paper and ink	9.5	11	14
Polish	7	10.1	12
Explosives	8.4	8.3	8
Electrical	6	5.8	5
Textile, cordage, etc.	6	5	4
Crayon	3.4	4.5	5.9
Chewing gum	3.5	4.3	5.8
Matches	2	2.5	3
Miscellaneous	2.5	2.5	2.5
Total	89.5	116.5	147.2

fairly well accepted figure for '58 (not including juice cartons). And a wax expert at Esso concludes from a look at industry progress in the first six months of '59 that plastic-coated cartons are now taking over 6-7% of the total market.

Besides Sealright, other container makers are working with plastic-coated containers. Ex-Cell-O and American Can have been experimenting with them, but trade talk is that Ex-Cell-O probably won't commer-

cialize them for another three or four years, and that American Can has decided to stick with wax for technological and economic reasons. Those who predict that plastic products will nab 10% of wax container markets in the next decade are betting that others beside Sealright will be pushing them actively. And, of course, Tetra-Pak is making headway with its unique carton—although its potential is still hard to predict.

One wax marketer sees the picture



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## MARKETS

this way: An estimated 12.2 billion paper containers (quart equivalents) were used to package milk in '57; about 11.4 billion of these were wax coated. Figuring an average wax use of 34.4 lbs./1,000 containers, some 196,000 tons of wax were consumed.

Plastic coating of the remaining 789 million cartons (estimated near 6.5% of the total market) apparently shaved 13,571 tons from the potential wax demand.

Analysts predict that close to 17 billion paper cartons will be used for milk in '65. But how many will be plastic coated is a matter of opinion—ranging from Sun's moderate 10% of the total market (in '68) to highly optimistic predictions that 30% of the market will be taken over by plastic containers by the mid-'60s.

A 20% market take-over (arbitrary average of the extremes) would still leave a near-200,000-tons wax demand (based on further forecasts that average quantity of wax used per 1,000 cartons will decline to about 29.4 lbs.); use of plastic on its share of the cartons would represent a slash of total yearly wax demand by some 50,000 tons.

**Cups, Nests Almost Full:** Wax consumption for manufacture of paper cups and nested containers increased about 130% in the past 10 years—from 23,200 tons in '48 to an estimated 58,000 tons this year. But now consumption is leveling off, although moderate growth is forecast until about '64. Then, the hard impact of plastic-coated or 100% plastic containers will likely be felt.

Peak consumption of wax for cups and nested containers is pinpointed at 71,000 tons in '63. The outlook for '68—after plastic containers move in solidly—is a significantly lower 66,000 tons.

**No Skid for Butter:** Wax consumption for packaging butter, margarine and ice cream increased a whopping 350% in the past decade. The score: 18,000 tons in '48 to 81,600 tons in '58 and to an estimated 86,300 tons in '59.

Demand in '57 and '58 was somewhat lower than the high of 86,400 tons in '56. Some observers—Sun for one—attributes this to the industry's failure to publicly report consumption and inventory buildup statistics. Inventories probably increased significantly in '57 and '58, because, for the

first time, demand lagged behind productive capacity.

This end-use is considered less vulnerable to encroachment by plastic products than most other paper outlets. Reason: waxed board provides the desired rigidity and moisture-vapor resistance at low cost. One newly developed carton is wax-laminated board, which has no surface wax but provides improved qualities and, significantly, uses more wax.

An increased output of packaged butter, margarine and ice cream is expected to hike wax consumption about 50% to an estimated 128,600 tons in '68.

**Thaw for Frozen Foods:** The amount of wax used to make frozen-food containers is small, compared with other wax uses. This may be due partly to improper reporting of primary paperboard data—some of the frozen-food stock may be included in the butter and ice cream category. But, in any case, on a typical package, the waxed paper overwrap contains more wax than the carton; only about 10% of the finished boardweight is wax.

Although use of polyethylene-coated board and all-plastic pouches may further reduce this outlet, wax consumption for making frozen-food cartons is expected to increase about 80%, from 9,000 tons in '58 to 17,100 tons in '68.

The miscellaneous food board category of the paper and paperboard wax market has increased, but slowly, during the past decade—from 19,300 tons in '48 to 25,100 tons in '58. Demand in the peak years of '51 and '52 was 32,600 tons and 31,700 tons, respectively.

And no sizable increase is expected; a hike to about 30,400 tons in '68 is pinned primarily to a likely 22% population growth.

**Waxed Paper Hopes Wane:** The waxed paper industry's outlook is not bright, from a wax-consumption viewpoint; the increased needs for glassine—at most, 3,000 tons in the next decade—aren't expected to offset a likely decline in requirements for standard waxed paper. Total wax needs by the industry (both waxed paper and glassine) in '68 are put at about 96,000 tons, a 10% drop from '58.

Makers of waxed paper reduced

their wax demand from a peak 119,000 tons in '51 to 97,000 tons in '54, largely because of competition from other materials, particularly cellophane.

Waxed paper regained some markets, especially in the breadwrap field, in '55 and '56, after aggressive advertising campaigns. But competition is felt increasingly by the industry. Admittedly, the future seems brightest for newer package wraps, e.g., saran, aluminum foil, polyethylene film. Polyolefin films and to a lesser extent, cellophane, seem to have good chances of growth in the breadwrap field.

**Sizing Increase:** Consumption of wax for sizings and miscellaneous paper and paperboard applications will increase an estimated 45% in the next 10 years. Sizings represent the major part of this category.

Consumption of wax for sizes grew steadily to about 15,000 tons in '58. About half was slack wax containing 5-20% oil; about 20%, scale wax; the rest, FRP (fully refined paraffin).

Miscellaneous wax uses include imparting of water resistance to some corrugated and container boxes (e.g., for packaging produce); "lubricating" furniture and appliance cartons to prevent scuffing; bonding of foil to paper, and paper to paper and paperboard, where a reasonably inexpensive adhesive is satisfactory.

**Many Other Outlets:** While the paper and paperboard industry alone takes about 80% of the wax consumed each year, a large number of other consuming industries divide up the remaining 20%. The diversity of applications make end-use analysis difficult, but Sun Oil market researchers point to some significant trends in this area.

Largest consumer in this miscellaneous grouping is the candle industry, which currently takes about 34,000 tons/year of wax. The candle business is growing steadily, and that industry's wax demand has increased 33% (to 45,000 tons in '58). About half the requirement is for scale wax, the other half for FRP.

Wax demand by manufacturers of tires and other rubber goods has grown considerably with increasing use of synthetic rubber (wax is used to prevent surface checking and cracking and as a processing aid). Demand may increase an estimated

60% in the next 10 years—the same rate at which synthetic rubber consumption is expected to grow; that would mean 27,000 tons in '68.

**Switch from FRP:** According to Sun Oil, '58 was marked by intense competition in the petroleum wax market, resulting in both reduced sales and profits for wax consumers and suppliers. Some users reportedly switched from FRP to scale wax to cut costs; and there were also indications that some marketers offered "premium quality scale wax" to obtain additional business and maintain an artificial price level for conventional scale and FRP. These practices, it's believed, underlie changes in FRP and scale wax markets in '58, compared with '57.

Total U.S. wax production paced increasing demand during the past decade, but output was down 4.5% in '58. Over-all production was up 50% in the '48-'58 period, but growth rates of the various types of wax differed considerably. Microcrystalline output increased 170% while FRP output rose 10% and that of "other" waxes\* increased 90%.

In '58, FRP production was down 17% and output of "other" waxes was up 15%—denoting a change in marketing and purchasing practices.

Although demand figures by type of wax are not available, some general trends have been observed. Demand is now strongest for micro-waxes and high-melting paraffins, while supplies of lower-melting paraffins are long and demand is relatively weak. For many end-uses, industry consumption has gradually changed from the low- and medium-melting paraffins to high-melting paraffins.

Increased consumption of dairy wax, say some, has probably saved the market for intermediate-melting-point paraffins from serious difficulties. The amount of microwax used in blends has increased considerably (one estimate: 40% of the mixture is microwax) and more micro would be used if prices were closer to FRP tabs. (Incidentally, the January price decrease of 1/2¢/lb. for scale and FRP reflects the softness of the '58 market, and offerings under the new prices are still prevalent. A further drop of 1/4 to 1/2¢/lb. is considered possible in '59 unless demand picks up sharply.)

**Exports Skid:** During the '48-'51

\* Includes scale, crude scale and slack waxes.

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## MARKETS

period, about 28% of U.S.-produced wax was exported. But overseas shipments declined—to about 18% of total production—in '56-'58. Further reductions in both percent and volume of wax exported are expected during the next decade—which means that more wax may become available for domestic use.

Although many marketers agree that wax exports will decline, others won't go along completely with this line of thinking, point out that foreign wax production isn't increasing particularly rapidly while packaging requirements of wax by other countries are growing. Wax exports, these observers suggest, will level off, rather than decline, during the coming decade.

In any case, the expected trends in export markets appear to be a matter of individual interpretation of an area in which no really rapid changes are foreseen—even those who predict a decline indicate it will be gradual, not precipitate.

The U.S. wax industry is in a period of readjustment, for the many reasons noted; but there are also factors—some potentially industry-shaking—whose effects can't now be foreseen. Few would hazard a guess, for example, about what will be the ultimate impact, on wax markets, of the controversial new food additives amendment to the Food, Drug and Cosmetic Act. Only one thing is certain, the wax industry won't be able to duck the issue of how the various types of wax and wax products will comply with newly established federal controls. Encouraging fact is that the industry—now engaged in a thorough check of wax products—has yet to find any evidence suggesting that the industry is headed for trouble with respect to the amendment.

As of now, the U.S. wax industry's market analysts appear generally agreed that there will be no over-all shortage of wax, nor a spectacular increase in demand in the foreseeable future; present production facilities are considered adequate to meet demand at least until '61. Although no immediate crisis affecting supply/demand is apparent, it's clear too that U.S. wax marketers will have to keep constant check on the industry's progress and be ready to shift their marketing tactics to meet new challenges as they unfold.

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**Technical Service—An excellent opportunity for** young man to join the Technical Department of the expanding Plastics Division of Spencer Chemical Company. This man should have a strong background in chemical engineering or chemistry, with a minimum of three years' experience in the field of polyolefins and nylon, and have intimate contact with field technical service work. In reply, please send detailed resume of experience, education and salary requirements to: Personnel Manager, Spencer Chemical Company, 610 Dwight Building, Kansas City 5, Missouri.

**Polymer Chemist—Openings now exist for a** chemist with experience in organic or physical basic work on polymers. PhD is desired or the equivalent in work experience. Permanent location in Akron, Ohio. Reply should give details of education, research background and salary required. Liberal company benefits including fully paid life insurance and hospitalization. All letters completely confidential and will be answered promptly. O. D. Taliaferro, Salaried Personnel—RMP The Goodyear Tire & Rubber Company, 1144 East Market Street, Akron 16, Ohio.

**Stanford Research Institute offers challenging** employment opportunities in chemical marketing research to Chemical Engineers or Chemists with 5 years of broad-line industrial experience in commercial chemical development, market research, or economic feasibility studies. Advanced technical or business degree preferred. Top level industry contacts, authorship of professional articles, and foreign travel possibilities complement an atmosphere conducive to development of personal competence. For information, send resume to Economics Employment Coordinator, Stanford Research Institute, Menlo Park, California.

### SELLING OPPORTUNITIES AVAILABLE

**Chemical jobber upstate New York, fine well-**established line Industrial Chemicals, requires services experienced Industrial Chemical Salesman. Liberal salary, commissions, expenses. Car furnished. Opportunity advancement. Chance to buy into company over the years. If experienced, send resume to SW-2107 Chemical Week. Our employees know of this advertisement.

**Salesmen—With BS degree in chemistry or** chemical engineering experienced in selling industrial chemicals to fill present opening in our sales department. Apply to: Industrial Relations Manager, Hooker Chemical Corp., Niagara Falls, N.Y.

**If you are a manufacturer seeking new or** added sales outlets—or if you are a manufacturer's agent or chemicals distributor with the capacity, time and energy to take on additional lines—make your interests known in this column of Chemical Week. The right agent or jobber teamed up with the saleswise manufacturer makes the right combination for the hard selling days ahead. There's profit for both, which can be initiated through low-cost classified advertising. Write Employment Opportunities, Chemical Week, P.O. Box 12, New York 36, N.Y.

### POSITION WANTED

**Lubricants, Colloidal Compounds: Technical** service and sales to metal-working, electronic, glass, ceramic, other industries. Ohio, vicinity. PW-2255, Chemical Week.

### CONTRACT WORK WANTED

**Custom Grinding—Ultra Fine or Course—Specialty** or Volume Blending and Grinding service on unit or contract basis. Complete COB installation for Nylon, Teflon and Heat Sensitive Materials. A Cramer Corp., 10881 S. Central Avenue, Box 682 Oak Lawn, Illinois.

### MANAGEMENT SERVICES

**"In Engineering, It's the People that Count."** Engineers and Contractors for the Petroleum and Chemicals Industries. The C.W. Nofsinger Co., 307 East 63rd St., Kansas City 13, Mo.

### BUSINESS OPPORTUNITY

**Common Market—Import-Export. Responsible** young, aggressive executive; available for European assignments; all inquiries confidential. BO-2263, Chemical Week.

### FOR SALE

**\$3,000,000 Liquidation—Chemical Plant at** Orange, Texas. Type 316 Stainless Steel Tanks, Kettles, Heat Exchangers, Columns, Stills, Crystallizers, Centrifugals, Pumps, Valves, etc. Wonderful Values. Send for list. Perry Equipment Corp., 1415 N. 6th St., Philadelphia 22, Pa.

**1—7'6" x 60' long Rotary Kiln or Dryer, 1/2"** welded shell. Complete. Perry Equipment Corporation, 1415 N. Sixth St., Philadelphia 22, Pa.

### WANTED

**Wanted Used Lab Equipment, Including: Analy-**tical Balances, scales, furnaces, ovens and miscellaneous equipment. Write Box 7151, Pittsburgh 13, Pa.

**This Tracer Section can be used whenever you** are looking for or offering Equipment, Plants Supplies, Chemicals, Opportunities, Special Services. The rates are low—just call or write Classified Advertising Division, Chemical Week, P.O. Box 12, N. Y. 36, N. Y. LONcgre 4-3000.

### MISCELLANEOUS

**To Employers Who Advertise for Men: The** letters you receive in answer to your advertisements are submitted by each of the applicants with the hope of securing the position offered. When there are many applicants it frequently happens that the only letters acknowledged are those of promising candidates. (Others do not receive the slightest indication that their letters have even been received, much less given any consideration.) These men often become discouraged, will not respond to future advertisements and sometimes even question if they are bona fide. We can guarantee that Every Advertisement Printed Is Duly Authorized. Now won't you help keep our readers interested in this advertising by acknowledging every application received, even if you only return the letters of unsuccessful applicants to them marked "Position filled, thank you." If you don't care to reveal your identity, mail them in plain envelopes. We suggest this in a spirit of helpful co-operation between employers and the men replying to Positions Vacant advertisements. Classified Advertising Division, McGraw-Hill Publishing Company. "Put Yourself in the Place of the Other Fellow."

# Chemical

Week

## BUSINESS BENCHMARKS

'59 OUTPUT INDEX

1958

'59 PRICE INDEX

1958

AUGUST 8, 1959

### WEEKLY BUSINESS INDICATORS

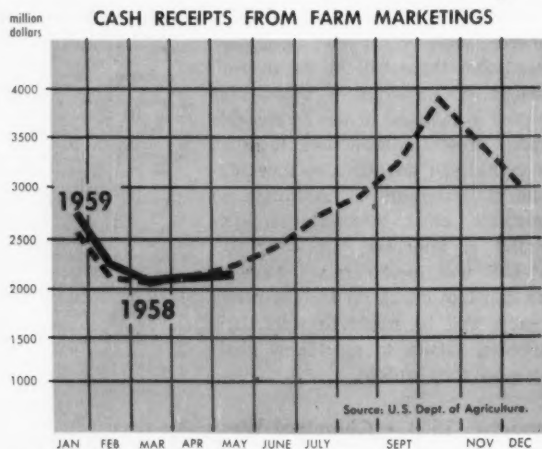
	LATEST WEEK	PRECEDING WEEK	YEAR AGO
Chemical Week output index (1947-1949=100)	205.0	203.5	170.0
Chemical Week wholesale price index (1947=100)	111.0	111.0	110.5
Stock price index (12 firms, Standard & Poor's)	61.60	59.78	43.63
Steel ingot output (thousand tons)	362	365	1,561
Electric power (million kilowatt-hours)	13,577	13,415	12,319
Crude oil and condensate (daily av., thousand bbls.)	6,855	6,858	6,536

### MONTHLY INDICATORS—Trade

(million dollars)

	Manufacturers' Sales			Manufacturers' Inventories		
	LATEST MONTH	PRECEDING MONTH	YEAR AGO	LATEST MONTH	PRECEDING MONTH	YEAR AGO
All manufacturing	\$30,525	\$30,266	\$25,206	\$51,472	\$51,052	\$50,896
Chemicals and allied products	2,096	2,090	1,875	3,745	3,696	3,796
Petroleum and coal products	2,970	3,080	2,657	3,390	3,367	3,377
Paper and allied products	1,013	1,034	895	1,467	1,463	1,455
Textile products	1,302	1,253	994	2,465	2,482	2,584

### CHEMICAL CUSTOMERS CLOSE-UP





## Completes 46 Structures in 4 Months

at Petroleum Chemicals, Inc.

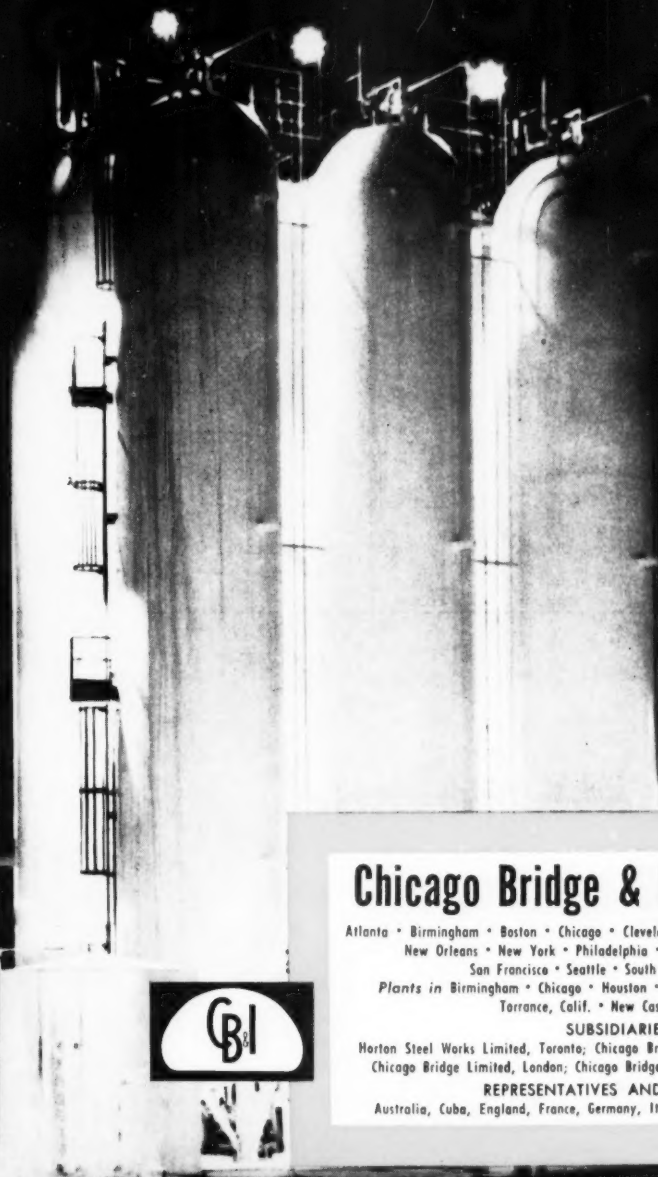
CB&I's *coordinated services* played a major role in construction of three new petrochemical plants recently placed on-stream by Petroleum Chemicals, Inc., at Lake Charles, Louisiana.

CB&I's assignment: Fabricate and erect 13 processing towers and 33 storage tanks for an expansion program that would—and did—put three plants in operation during a four-month period.

The new plants—ammonia, ethylene and ethylene oxide-glycol—have catapulted Petroleum Chemicals into a major petrochemicals producer, less than four years after its founding.

Companies on the move, such as Petroleum Chemicals, know they can depend on CB&I's *coordinated services* to meet exacting specifications and schedules. The reason: Expert, *one source* responsibility for engineering, fabrication and erection.

These are the benefits of CB&I's seven decades of *craftsmanship in steel*. Write our nearest office for the bulletin: *Development of the Oil Storage Tank*.



Propane is stored in these vertical blimps built by CB&I for Petroleum Chemicals. Each structure is 60 feet high, 12½ feet in diameter and has a 1,500-barrel storage capacity.

### Chicago Bridge & Iron Company

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston • Kansas City  
New Orleans • New York • Philadelphia • Pittsburgh • Salt Lake City  
San Francisco • Seattle • South Pasadena • Tulsa

Plants in Birmingham • Chicago • Houston • Salt Lake City • Greenville, Pa.  
Torrance, Calif. • New Castle, Delaware

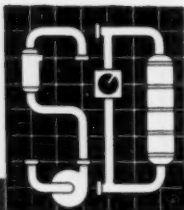
#### SUBSIDIARIES:

Horton Steel Works Limited, Toronto; Chicago Bridge & Iron Company Ltd., Caracas;  
Chicago Bridge Limited, London; Chicago Bridge Construccoes Ltda., Rio de Janeiro

#### REPRESENTATIVES AND LICENSEES:

Australia, Cuba, England, France, Germany, Italy, Japan, Netherlands, Scotland



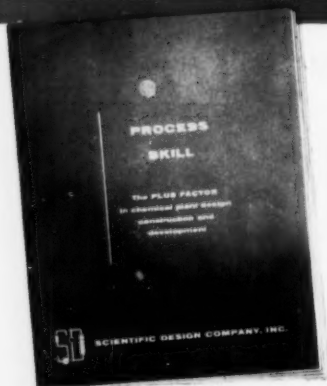


**FOREMOST IN CHEMICAL PLANT  
DESIGN • CONSTRUCTION • DEVELOPMENT**

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and Cyclohexanol**  
from cyclohexane
- **Vinyl acetate**
- **Polyethylene**  
by high pressure synthesis
- **Formaldehyde**  
from methane
- **Methyl ethyl ketone**
- **Phthalic anhydride**
- **Acetic acid**
- **Acetylene**
- **Ethanolamines**
- **Ethylene oxide-glycol**  
(new 1960 model)
- **A number of other new  
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and products**



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## **SCIENTIFIC DESIGN COMPANY, INC.**

EXECUTIVE OFFICES: TWO PARK AVENUE, NEW YORK 16, NEW YORK

THE SD AFFILIATED GROUP:

SD Plants Inc., Two Park Avenue, New York 16, New York

SD Plants Ltd., Bush House, Aldwych, London WC 2, England

Catalyst Development Corporation, 59 Industrial Avenue, Little Ferry, New Jersey

Société Française des Services Techniques S. a. r. l., 52 Champs Elysees, Paris 8e, France

